Another important feature of the Price-Anderson Act is the monetary limitation on liability. To the extent that damages exceed the amount of coverage required by the Act, all responsible parties are relieved of further liability; Congress is then required to investigate the incident and take appropriate action.

The Price-Anderson Act provides for liability coverage through a system of private insurance and government indemnity. Under the Act's private insurance system, utility owners of large NRC-licensed commercial nuclear power reactors are required to maintain the maximum amount of insurance available from private sources (currently, $160 million). Should claims arising from a nuclear incident (related to the activities of such NRC licensees) exceed the amount of primary insurance, all licensees of large nuclear power reactors would be assessed up to $5 million per reactor. With 98 large reactors now licensed to operate (as of January 1986), a second layer of coverage is provided in the amount of $490 million. Both forms of coverage provide a total of $640 million in the event of a serious nuclear incident at a nuclear power plant or an incident occurring in the course of transportation to or from such a facility.

The Price-Anderson Act also authorizes the DOE to enter into indemnity agreements with its contractors for activities, under contract and conducted for the benefit of the United States, that involve "the risk of public liability for a substantial nuclear incident." The indemnity coverage under such contracts provides that, in the event of a nuclear incident arising out of, or in connection with, a contractual activity, the contractor and any other person who may be liable would be indemnified by the DOE, up to the statutory limit of $500 million. Indemnity coverage under DOE agreements further extends to nuclear incidents arising in the course of transportation to or from contractor locations. The DOE does not require contractors to carry additional liability insurance because the cost of any such insurance would be passed on to the DOE. Since the enactment of the Nuclear Waste Policy Act, the DOE has indicated that indemnity agreements based on the Price-Anderson Act will be included in its contracts for the operation of any DOE facility associated with the waste-management program (e.g., a geologic repository and MRS facility, if approved by Congress). Under the indemnity agreement, the DOE is to indemnify the facilities' operating contractor and any other person who may be liable for a nuclear incident arising out of, or in connection with, radioactive waste management. Coverage for waste-management activities would extend to transportation to or from a waste-management facility.

Congressional review of the Price-Anderson Act is now under way and is expected to be completed by 1987, when the Act will expire unless reauthorized. The DOE has offered recommendations to Congress pertaining to the Act's contractor indemnity system and the application of that system to activities conducted under the Nuclear Waste Policy Act. Such recommendations include the following:

- Extended liability coverage. While a limitation on liability is supported, the DOE has recommended that the extent of coverage under DOE indemnity agreements be comparable to that afforded by large commercial utilities.

- Explicit coverage of activities conducted under the Nuclear Waste Policy Act. While the DOE believes that the present language of the Price-Anderson Act is sufficient to permit indemnification coverage for nuclear waste operations, explicit coverage under the Act is supported.

- Application of ENO provisions to waste-management activities. The DOE supports the extension of the Act's ENO provisions, with the related waiver of defenses, to incidents connected with the transportation, storage, and disposal of civilian and defense high-level waste.

- Source of funding. The DOE supports the provision of liability coverage for waste-management activities conducted under the Nuclear Waste Policy Act through expenditures of the Nuclear Waste Fund (which in turn is financed through fees paid by the generators and owners of radioactive waste).

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Appendix B

AVAILABILITY OF REFERENCES

Appendix B

AVAILABILITY OF REFERENCES

B.1 REFERENCES CITED IN ALL EAs

The references cited in all of the draft and the final environmental assessments (EAs) are available for public review in DOE reading rooms at the following locations.

U.S. Department of Energy
Public Reading Room
FOI, Room 1E-190
1000 Independence Avenue, S.W.
Washington, DC 20585

Albuquerque Operations Office
National Atomic Museum
Kirkland Air Force Base East
Albuquerque, NM 87116

Chicago Operations Office
9800 South Cass Avenue
Argonne, IL 60439

Idaho Operations Office
550 Second Street
Idaho Falls, ID 83401

Nevada Operations Office
2753 South Highland Drive
Las Vegas, NV 89109

Oak Ridge Operations Office
Federal Building
Oak Ridge, TN 37830

Richland Operations Office
Federal Building
Richland, WA 99352

San Francisco Operations Office
Wells Fargo Building
1333 Broadway
Oakland, CA 95612

Savannah River Operations Office
Savannah River Plant
Aiken, SC 29801

B.2 REFERENCES CITED IN THE EA FOR THE BASALT (HANFORD) SITE

The references cited in the EA for the Hanford site are available for public review at the following locations:

Idaho

Boise Public Library and
Information Center
715 Capitol Boulevard
Boise, ID 83702

Coeur D'Alene Public Library
703 Lakeside Avenue
Coeur D'Alene, ID 83814

Lewiston City Library
428 Thain Road
Lewiston, ID 83501

University of Idaho Library
(Federal Depository)
Moscow, ID 83843

Oregon

Portland State University
(Federal Depository)
Bradford Price Millar Library
934 Southwest Harrison
Portland, OR 97207

Umatilla County Library
214 North Main Street
Pendleton, OR 97801

Washington

University of Washington Libraries
M-171 Library, FM-25
Seattle, WA 98195

Central Washington University
D and 11 Street
Ellensburg, WA 98926

Washington State Library
(Federal Depository)
Temple of Justice
Olympia, WA 98504

Pasco Public Library
1320 West Hopkins
Pasco, WA 99301

Seattle Public Library
1000 Fourth Avenue
Seattle, WA 98104

Fort Vancouver Regional Library
1007 East Mill Plain Boulevard
Vancouver, WA 90663

Prosser Public Library
902 Seventh Street
Prosser, WA 99350

State of Washington Dept. of Ecology
Office of High-Level Nuclear Waste Management
Reference Center
5826 Pacific Avenue
Lacey, WA 98504

Eastern Washington University
John F. Kennedy Memorial
Cheney, WA 99004

Washington State University Library
Holland Library, Room 221
Library Road
Pullman, WA 99164-5610

Mid-Columbia Library
405 South Dayton
Kennewick, WA 99336

Richland Public Library
Swift and Northgate
Richland, WA 99352

Spokane Public Library
Comstock Building Library
West 906 Main Avenue
Spokane, WA 99201

Walla Walla Public Library
238 East Adler
Walla Walla, WA 99362

U.S. Department of Energy
Reading Room, Hanford Science Center
825 Jadwin Avenue
Richland, WA 99352

Yakima Valley Regional Library
102 North Third Street
Yakima, WA 98901

B.3 REFERENCES CITED IN THE EA FOR THE SALT SITES

The references cited in the EAs for the Davis Canyon, Utah, Deaf Smith, Texas, and Richton, Mississippi, are available for public review at the following locations:

Louisiana

Minden Nuclear Waste Information Office
221 Main Street
Minden, LA 71005

Webster Parish Library
521 East and West Streets
Minden, LA 71005

Bienville Parish Library
604 South Maple
Arcadia, LA 71001

Mississippi

Richton Nuclear Waste Information Office
103 Dogwood
Richton, MS 39476

Pine Forest Regional Library
Main Street
Richton, MS 39476

Jackson Metropolitan Library
301 North State Street
Jackson, MS 39201

Hattiesburg Public Library
723 Main Street
Hattiesburg, MS 39401

Jones County Junior College Library
Front Street
Ellisville, MS 39437

Harrison County Library
14th Street and 21st Avenue
Gulfport, MS 39510

Jackson-George Regional Library
3214 Pascagoula Street
Pascagoula, MS 39567

Harriette Person Memorial Library
College Street
Port Gibson, MS 39150

Laurel-Jones County Public Library
530 Commerce Street
Laurel, MS 39440

Texas

Deaf Smith County Library
211 East Fourth Street
Hereford, TX 79045

Swisher County Library
127 Southwest Second Street
Swisher County Memorial Building
Tulia, TX 79088

Canyon Public Library
301 16th Street
Canyon, TX 79015

Rhoads Memorial Library
103 Southwest Second Street
Dimmitt, TX 79027

Gabie Betts Burton Memorial Library
217 S. Karney St.
Clarendon, TX 79226

Austin Public Library
800 Guadalupe Street
Austin, TX 78768

Texas (continued)

Amarillo Public Library
413 East Fourth Street
Post Office Box 2172
Amarillo, TX 79189

Texas Nuclear Waste Programs Office
Sam Houston Office Building, Room 204
200 East 14th Street
Austin, TX 78711

Tulia Nuclear Waste Information Office
Griffith Estate Building
100 S.E. Second
Tulia, TX 79088

University of Texas General Library
Post Office Box P
Austin TX 78712

Hereford Nuclear Waste Information Office
115 East First Street
Hereford, TX 79045

Utah

Moab Nuclear Waste Information Office
471 South Main Street No. 3
Moab, UT 84532

Monticello Nuclear Waste Information Office
San Juan County Courthouse
117 South Main Street, Room 12
Monticello, UT 84535

Grand County Public Library
25 South First Street East
Moab, UT 84532

Grand County High School Library
300 South 100 East
Moab, UT 84532

San Juan County Library
266 North Main Street
Monticello, UT 84535

Monticello High School Library
Media Center
55 North Second Street West
Monticello, UT 84535

San Juan County Library
50 West First Street South
Blanding, UT 84535

Mesa County Public Library
530 Grand Avenue
Grand Junction, CO 81501

Salt Lake City Public Library
2197 East 7000 South
Salt Lake City, UT 84121

University of Utah
Marriott Library
Salt Lake City, UT 84112

B.4 REFERENCES CITED IN THE EA FOR THE TUFF SITE

The references cited in the EA for the Yucca Mountain site are available for public review at the following locations:

Amargosa Valley Community Library
Star Route 15
Box 40-T
Amargosa Valley, NV 89020

Beatty Community Library
4th and Ward
P.O. Box 128
Beatty, NV 89003

Clark County Library
1401 E. Flamingo
Las Vegas, NV 89109

Lincoln County Library
P.O. Box 330
Pioche, NV 89043

Nevada State Library
401 N. Carson
Capitol Complex
Carson City, NV 89710

University of Nevada at Las Vegas
James R. Dickinson Library
4505 Maryland Parkway
Las Vegas, NV 89154

United States Department of Energy
Nevada Operations Office
Public Reading Room
2753 South Highland
Las Vegas, NV 89109

Law Library
Nye County Courthouse
P.O. Box 393
Tonopah, NV 89049

Nevada Legislative Council Bureau
Research Library
Legislative Building
Capitol Complex
Carson City, NV 89710

Northern Nevada Community College
Learning Resource Center
901 Elm Street
Elko, NV 89801

University of Nevada at Reno
Getchell Library
Reno, NV 89557

Washoe County Library
301 Center Street
Reno, NV 89502

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Nuclear Waste Policy Act
(Section 112)

Environmental Assessment

Yucca Mountain Site, Nevada Research and Development Area, Nevada

Volume III

May 1986

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

DOE/RW-0073
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Environmental Assessment

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Washington, DC 20585

Appendix C

COMMENT-RESPONSE DOCUMENT

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Appendix C

C.1 INTRODUCTION

This appendix responds to the issues raised by Federal, State, and local governments, affected Indian Tribes, private citizens, and other organizations on the draft environmental assessment (EA) that was prepared pursuant to Section 112 of the Nuclear Waste Policy Act of 1982 (the Act). In addition to presenting the issues raised in the comments and the responses, it describes where changes were made in the final EA.

C.1.1 THE COMMENT PROCESS FOR THE ENVIRONMENTAL ASSESSMENTS

A notice of availability of the draft EA appeared in the Federal Register of December 20, 1984. This notice requested interested parties to review and comment on the draft EA, allowing 90 days for the comment period. The notice also announced an extensive series of public briefings to be held in each of the six States containing potentially acceptable sites for the first repository. These briefings were conducted solely to provide information on the draft EAs, not to solicit comments. Several weeks after the briefings, the DOE held hearings in which the public was invited to submit testimony for the public record.

Comments on the draft EA were in the form of letters addressed to the U.S. Department of Energy and of oral statements presented at 19 public hearings conducted in February and March 1985. Each comment letter or the recorded statement of each hearing participant was given a document-identification number and examined to identify comments. The comments in each letter were numbered sequentially. Copies of the comments and letters can be seen in the public reading rooms at DOE Headquarters and the Project Offices.

Each comment was classified according to subject area and assigned a classification number that corresponds to a section of the Comment Response Document. By referring to the index at the end of this section, each commenter can find the section of the appendix where the issues raised by the comments are addressed.

The subject matter of the comments fell into seven different areas: policy issues; siting process and decisions; data base, proposed activities, and repository design; postclosure performance; preclosure radiological safety; environment, socioeconomics, and transportation; and ease and cost of siting, construction, operation, and closure. The last four groups correspond to the division of technical areas in the general siting guidelines (10 CFR Part 960). Each group is further broken down into more specific topic areas shown in Section C.1.2. Where appropriate, Section C.1.2 shows the section of the EA to which the comment referred.

Within each topic area the the individual comments were screened to determine the specific issues they addressed. Responses were then prepared for each issue. Editorial comments (e.g., spelling and grammatical errors, incorrect cross-referencing, and errors in tables and figures) were considered during the preparation of the final EA, and the appropriate changes were made. Such comments are not specifically discussed in this appendix. Responses to technical issues identify how and to what degree the issue has been incorporated into the final EA. Where possible the response identifies the places in the final EA where the change was made. For technical comments addressing concerns outside the scope of the document, a statement is made to that effect.

C.1.2 CLASSIFICATION OF COMMENTS

C.1.2.1 Policy and programmatic issues

Section C.2 summarizes and responds to comments that are concerned mainly with policy and programmatic issues. Most of these comments do not address siting decisions or the evaluations reported in the EAs. The exceptions are general comments on transportation, many of which are directed at Appendix A of the draft EAs.

Classification number	Subject
C.2.1	Public involvement and institutional issues
C.2.2	Legal and regulatory issues
C.2.3	Program management, costs, and schedules
C.2.4	Transportation, retrievability, and second repository
C.2.5	Other waste-management activities
C.2.6	Types of waste to be received at a repository
C.2.7	The draft environmental assessments
C.2.8	Miscellaneous

C.1.2.2 Siting process and decisions

Section C.3 addresses questions on the siting process and decisions. Many comments on siting decisions are closely related to technical evaluations of baseline conditions at the sites and of site suitability on the basis of the technical guidelines. Comments that primarily address site-suitability evaluations or supporting information are not included in this section; comments that address the application of suitability evaluations in the rankings of sites are included in this section.

Classification number	Subject	EA section
C.3.1	Site screening and guidelines issues	1.2, 2.2
C.3.2	Evaluation of disqualifying conditions	2.3
C.3.3	Evaluation of the geohydrologic setting	1.3, 2.4
C.3.4	Nomination and recommendation of sites for characterization	7.1, 7.2, 7.3

C.1.2.3 Data base, proposed activities, repository design

Section C.4 addresses comments on the accuracy or adequacy of the baseline information about the repository system, site characterization activities, and the site itself that is used to evaluate site suitability and the impacts of developing the site.

Classification number	Subject	EA section
C.4.1	Baseline conditions at the site	3.2, 3.3
C.4.2	Activities proposed for site characterization	
C.4.3	The repository (including the waste package	5.1

C.1.2.4 Postclosure performance

Section C.5 includes comments on the condition and performance of the repository after it is closed and sealed.

Classification number	Subject	EA section
C.5.1	Geohydrology	6.3.1.1, 5.2.2
C.5.2	Geochemistry	6.3.1.2, 5.2.1, 3.2
C.5.3	Rock characteristics	6.3.1.3, 5.2.1, 3.2
C.5.4	Climate changes	6.3.1.4, 3.4.3
C.5.5	Erosion	6.3.1.5, 5.2.1, 3.2

Classification number	Subject	EA section
C.5.6	Dissolution	6.3.1.6, 5.2.1, 3.2
C.5.7	Tectonics	6.3.1.7, 5.2.1, 3.2
C.5.8	Human interference (natural resources)	6.3.1.8, 5.2.1, 3.2
C.5.9	Postclosure site ownership and contro.	6.2.1.1, 3.4.1
C.5.10	Postclosure system guideline	6.3.2
C.5.11	Assessment of postclosure performance	6.4.2

C.1.2.5 Preclosure radiological safety

Section C.6 addresses comments on the behavior and effects of radionuclide releases during repository operations.

Classification number	Subject	EA section
C.6.1	Population density and distribution	6.2.1.2, 5.4.1, 3.6.1
C.6.2	Site ownership and control	6.2.1.3, 3.4.1
C.6.3	Meteorology	6.2.1.4, 3.4.3
C.6.4	Offsite installations and operations	6.2.1.5
C.6.5	System guideline	6.2.2.1
C.6.6	Assessment of preclosure performance	6.4.1

C.1.2.6 Environment, socioeconomics, and transportation

Section C.7 addresses comments on (1) the environmental, socioeconomic, and transportation-related effects of repository development and site characterization; (2) the technical guidelines for socioeconomics, transportation, and the environment; and (3) the use of these guidelines in evaluating the relevant system guideline. Most comments in this category are concerned with the characteristics of the repository before it is closed and decommissioned.

Classification number	Subject	EA section
C.7.1	Expected effects of site characterization	6.3.5
C.7.2	Environmental quality	6.2.1.6
C.7.3	Expected effects of transportation	5.3, 6.2.1.8, 3.5
C.7.4	Expected effects on socioeconomic conditions	6.2.1.7
C.7.5	System guideline	6.2.2.2

C.1.2.7 Ease and cost of siting, construction, operation, and closure

Section C.8 addresses comments about the problems and costs of siting, constructing, operating, and closing the repository.

Classification number	Subject	EA section
C.8.1	Surface characteristics	6.3.3, 3.4.1, 5.1
C.8.2	Rock characteristics	6.3.3, 3.2, 5.1
C.8.3	Preclosure hydrology	6.3.3, 3.3, 5.1
C.8.4	Preclosure tectonics	6.3.3, 3.3, 5.1
C.8.5	System guideline	6.3.4

C.1.2.8 Project-specific miscellaneous

Section C.9 addresses site-specific issues that are not addressed in the technical sections of the document.

C.2 POLICY ISSUES

Many of the comments on the draft EAs were concerned with various policy issues, which are addressed in this section: public involvement and institutional issues (Section C.2.1); compliance with Federal and State laws and regulations, including interpretations of the Nuclear Waste Policy Act (Section C.2.2); program management, costs, and schedules (Section C.2.3); policy issues related to waste management, such as transportation, retrievability, monitored retrievable storage, and spent-fuel reprocessing (Sections C.2.4 and C.2.5); and the types of waste to be received at the repository (Section C.2.6). Also included in this section are direct comments on the draft EAs (Section C.2.7) and miscellaneous issues (Section C.2.8).

C.2.1 PUBLIC INVOLVEMENT AND INSTITUTIONAL ISSUES

This section addresses comments on public involvement and institutional issues. These issues are divided into five categories: conduct of the public-participation process; interactions with States, affected Indian Tribes, and local communities; working with Federal agencies; working with other countries; and socioeconomic impacts.

C.2.1.1 The DOE's public participation process

Comments on the DOE's public-participation process were concerned mainly with reviews of, and hearings on, the draft EAs. Other issues in this category were related to the DOE's relations with the public and access to information.

C.2.1.1.1 Public review of the draft environmental assessments

Many commenters said that the 90-day comment period for the draft EAs was not long enough for a thorough review. Others complained about delays or difficulties in receiving copies of the draft EAs and suggested that the documents should have been available in public libraries.

Issue

Many commenters said that the 90-day public comment period did not permit a thorough review of the lengthy and technical draft EAs, especially since the beginning of the comment period coincided with the year-end holidays.

Response

The DOE issued the draft EAs for public comment in the interest of expanding public participation in the site-selection process. The issuance of draft EAs was not required by the Act, and it entailed significant penalties in schedule. The DOE decided to accept these penalties because it deemed this

opportunity for public involvement to be important. Futhermore, in response to public comments on the draft Mission Plan (DOE, 1984a) the DOE extended the planned EA comment period from 60 to 90 days. One of the purposes of this extension was to compensate for potential delays in the mailing and distribution of the documents during the holiday season.

To help the public understand the draft EAs, the DOE conducted a series of interactive briefings in January 1985 and 19 public hearings in February and March 1985 in the six States containing the sites and in an adjacent State.

In revising the EAs, a special effort was made to consider comments received after the March 20, 1985, deadline. The final EAs reflect comments received as late as August 30, 1985.

Issue

DOE representatives allegedly had promised that the comment period would be extended, but it was not.

Response

The DOE did not officially extend the public-comment period. However, as explained above, the DOE made every effort to consider comments received after the deadline, and, as mentioned above, the final EAs reflect comments received up to 5 months after the deadline.

Issue

Because the 90-day comment period began before his term, the new Governor of Utah had less opportunity for involvement.

Response

The State of Utah submitted supplementary comments. These comments were received on May 1, 1985, and were considered in revising the EAs.

Issue

Some persons said they had experienced difficulty in obtaining copies of the draft EAs or felt that the DOE's response to requests for copies was very slow.

Response

To facilitate requests for the draft EAs, the DOE set up toll-free telephone numbers for use by the general public during the 90-day comment period. Despite some initial difficulties, the toll-free system worked well as a means for requesting the EAs. However, the DOE recognizes with regret that some persons may have experienced delays in receiving the EAs. The demand for the EAs was great, and over 5,000 copies were distributed.

Issue

Some commenters said that documents like the EAs should be available in libraries to facilitate timely review. One party complained that access to the reference documents for the EAs was very poor in the local libraries.

Response

Copies of the draft EAs were placed in the public libraries of local communities closest to the potentially acceptable sites. In addition, copies were available in DOE public reading rooms, which are open during normal business hours and have copies of all available program-related materials, including most of the reference documents cited in the EAs. Moreover, the draft EAs and the reference documents were available in the DOE public information offices in communities near all the potentially acceptable sites.

Issue

One commenter recommended that in soliciting comments the DOE should give a name to whom to write, rather than "comments."

Response

In the Federal Register notice that announced the availability of the draft EAs, interested parties were requested to send comments to "Comments--EA," which was a special mail stop set up to receive comments letters. The names of several DOE officials were also given for further information on specific draft EAs. The intent was to facilitate the comment-response process by not overloading any single individual or mail stop.

C.2.1.1.2 Hearings

Several commenters complained about the public hearings on the draft EAs; they said that the DOE had not adequately notified the public about the hearings and that the hearings were scheduled at inconvenient times and locations. Others said that there were problems with the conduct of the hearings themselves: that unreasonable limits were placed on the scope of the subject matter and on the time allotted each speaker; that the hearings became an exchange of misinformation; and that panel members did not adequately represent the views of the community.

Issue

Some comments alleged that the public was not adequately notified about the hearings.

Response

Notices about the public hearings were published in the Federal Register. In order to reach the general public that does not have ready access to the Federal Register, the DOE also issued press releases from the DOE offices in Washington, D.C., as well as the DOE Project Offices

responsible for investigating the three types of host rock (basalt, salt, and tuff). In addition, the Project Offices mailed copies of the Federal Register notice of the availability of the draft EAs and the announcements of the public briefings and hearings to more than 4,000 persons and organizations that had in the past commented on, or inquired about, various aspects of the DOE's geologic-repository program. The DOE Office of Consumer Affairs made a similar mailing to approximately 200 consumer and public-interest groups, and the DOE Office for Congressional, Intergovernmental and Public Affairs notified the offices of U.S. Senators and Representatives. In addition, news releases were issued, paid advertisements were run in many local newspapers, and notices were posted in the public buildings of the local communities. In January 1985, the DOE held interactive briefings for State officials and for the public to provide information on the EAs and the public-comment process; the dates and locations of the hearings were publicized during these briefings.

Issue

Some persons objected that the schedules and the locations of the public hearings were inconvenient.

Response

The hearings were scheduled to begin more than 6 weeks after the draft EAs were issued on December 20, 1984, and several weeks after the briefings held to provide information about the EAs. This schedule allowed several weeks for preparing comments before the hearings and also time for preparing written comments after the hearings. The written comments were accorded the same importance as the oral testimony.

During February and March 1985, 19 public hearings were held in the six States containing the sites under consideration and in 1 adjacent State. The hearings were scheduled for both day and evening hours to accommodate as many people as possible. They were held in major cities that are readily served by all modes of transportation as well as in the local communities closest to, and most likely to be affected by, a repository at a particular site.

Issue

Commenters said that unreasonable limitations were placed on the scope and the procedures of the hearings, undue time limitations were placed on speakers, and the ground rules of the hearings were changed at the last minute.

Response

Although the DOE had hoped that the public would address the draft EAs in its comments, no attempt was made to limit the scope of the hearings.

In the notices of the public hearings, the DOE requested all people who wished to testify to register in advance. The agendas of the hearings were based on this preregistration. However, the DOE made it clear at each hearing that every person wishing to speak would have an opportunity. This was

accomplished by adjusting the time allotted each speaker, by extending the length of a session where necessary, and by holding an additional hearing in the State of Washington.

Hearing procedures were discussed at the public briefings that preceded the hearings, explained during registration, and again explained at the beginning of each session. They included time limits, which were necessary to give all interested parties a chance to speak. However, it was made clear at each hearing that, to accommodate all speakers, the session would be extended or additional hearings would be held. In addition, the public was reminded that written comments were welcome and could be submitted after the hearings, through March 20, 1985.

Issue

According to some commenters, public hearings should be forums for the DOE to educate the public rather than public exchanges of misinformation.

Response

The purpose of the hearings was to give the public an opportunity to be heard. The DOE uses other forums to supply information; an example is the series of briefings held during January 1985 to explain the draft EAs and the siting process and to answer questions. The hearing is the citizens' forum for educating the DOE about their needs, concerns, perceptions, and ideas. The DOE did not present information, nor did it discuss, except to clarify, the comments received at the hearings.

Issue

Some parties felt that "community representatives" on the hearing panels did not always accurately reflect the views of the community; in some cases, the presence of a particular individual could have been considered a conflict of interest.

Response

The role of the panelists was to clarify the testimony for the record, not to represent the community. Although the non-DOE panelists were selected by the DOE, they were not selected to represent any specific viewpoint.

Issue

Some commenters suggested that the DOE should open each public hearing to testimony on all of the sites rather than one specific site. This would help the public to compare the sites.

Response

None of the public hearings was restricted to the discussion of a particular site. Chapter 7, which presents a comparative evaluation of the sites against the siting guidelines, is common to all of the EAs, and to provide the reader with a basis for the comparison, the draft EAs for all nine sites were available as a package.

C.2.1.1.3 DOE relations with the public

Comments on the DOE's relations with the public covered a variety of topics, ranging from recommendations for a public referendum on waste disposal to complaints about the DOE's attitude toward the public. They also included requests for an early announcement of the sites to be recommended for characterization.

Issue

Some commenters suggested that there should be a public referendum on the issue of radioactive-waste disposal.

Response

The American political process provides citizens with several opportunities to make their views known at the local, State, and Federal levels. In 1982, the U.S. Congress, the elected representatives of the American people, found that "high-level radioactive waste and spent nuclear fuel have become major subjects of public concern, and appropriate precautions must be taken to ensure that such waste and spent fuel do not adversely affect the public health and safety and the environment for this or further generations" (Section 111(a)(7) of the Act) and therefore enacted the Nuclear Waste Policy Act of 1982. The Act stipulates the technical and public process that the DOE has been following since January 1983.

Issue

A commenter requested that the EA emphasize the "development of appropriate mechanisms to achieve public consensus" mentioned in a report.

Response

The progress report referred to a series of socioeconomic studies that will be undertaken throughout the repository-siting program. The development of public consensus is one of the objectives for the socioeconomics portion of the siting program.

Issue

Some commenters felt that the DOE has a negative attitude toward the public. Several people said that the public-involvement process was carried out solely for the sake of appearance, public comments were not taken seriously, and local sentiments will not really be considered in making the final decision.

Response

The comments of the public have been, and will continue to be, seriously considered in the decisionmaking process. The comments of the public were considered in revising the siting guidelines, and issues raised in the EA scoping hearings were considered in preparing the draft EAs. Substantive comments on the draft EAs have been considered in producing this appendix and the final EAs. Furthermore, the DOE believes that local citizens have

legitimate and vital interests in the repository program and has sought to learn their attitudes and concerns through meetings and workshops. Any appearance that the DOE has a negative attitude toward local citizens is unintended and clearly not in the interests of the DOE.

Issue

The DOE was accused of not being honest with the public, both in the context of the general program and on specific issues. For example, some persons felt that the presence of a drill rig at the Hanford site suggests that the DOE is already committed to that site.

Response

The perception of dishonesty may stem from two sources: ongoing changes in policy direction and inadequate information. Changes in policy direction are the by-product of a process that involves many people on all levels of government and the private sector. They result from changing circumstances, long time spans, improving data, and program growth and development. Although the unfortunate result may be the appearance of a coverup of facts as policy direction changes, the only alternative is an unacceptable rigidity.

To improve the problem of inadequate information, the DOE is committed to provide a full and timely flow of information about program activities to all affected parties and to provide frequent opportunities, both formal and informal, for the fullest possible participation in program activities. Accomplishing this depends on developing and maintaining information and interaction programs that meet the needs and address the concerns of States and Indian Tribes, local governments, affected citizens, the general public, and other interested parties. Detailed plans for achieving these goals are discussed in Part I of Volume I of the Mission Plan (DOE, 1985a).

Contractual arrangements for a drill rig at the Hanford site were made before the passage of the Act, but the rig has not been used at the site since the Act was passed and will be used only if Hanford is one of the sites recommended and approved for site characterization. The DOE is not committed to the Hanford site or any other site.

Issue

Commenters said that the public has not been fully informed about the site-selection process, particularly for the Deaf Smith and the Swisher sites in Texas.

Response

The potentially acceptable sites in Swisher and Deaf Smith Counties, Texas, were identified in the report Identification of Preferred Sites Within the Palo Duro Basin (DOE, 1984b) which was issued in draft form for comment in March 1984. The final report was released in November 1984. The boundaries of the sites in the final report were revised on the basis of comments on the draft report by the State of Texas and other parties. Both the draft and the

final reports were broadly distributed and made available in local libraries and information offices. Further, after the draft reports, the DOE held briefings to explain the site-selection process.

Issue

Some persons felt that a general mitigation policy of indemnifying local citizens against the burden of uncertainties should be developed.

Response

The DOE cannot eliminate uncertainty. However, it is taking steps to inform local citizens about its activities and to involve both State and local representatives in the siting process.

Issue

A number of commenters requested early announcement of the sites to be recommended for characterization. They said that the DOE should remove as soon as possible the worry of repository siting from the areas not being recommended.

Response

The DOE is acutely aware of the apprehension that citizens of the States with potentially acceptable sites are experiencing. However, the announcements of the sites nominated and recommended for characterization had to await the completion of the final comparative evaluation of the sites and the publication of the final EAs, the multiattribute utility analysis of the nominated sites, and the recommendation by the Secretary of Energy of candidate sites.

C.2.1.1.4 Access to information

Many parties felt that opposition to the waste-management program results from misinformation about, and exaggeration of, the possible adverse effects associated with a geologic repository. They suggested that an improved program of public information and education would increase understanding and thereby the acceptance of the program. Several commenters recommended improved information programs because informed consent by the public depends on the availability of accurate, intelligible information. Others offered specific recommendations or complaints.

Issue

The DOE should establish a major information program, including (1) a constant flow of information that is timely, accurate, and easily understood and (2) more-frequent hearings and information sessions.

Response

Recognizing that public information is crucial to the success of the repository program, the DOE is committed to a thorough program of public participation. Its plans for public information and outreach are described in Chapter 4 of Part I of Volume I of the Mission Plan (DOE, 1985a). Valuable contributions to the development of these plans have come from States, affected Indian Tribes, and the public. The DOE will continue to seek information from interested parties on developing ways to identify public concerns, to provide information that addresses these concerns, and to involve the public in the decision process.

Issue

Some commenters alleged that the DOE will disclose information only under a formal request under the Freedom of Information Act.

Response

The DOE routinely shares program information with all of the affected parties and public and has specifically established information offices for that purpose. Information is disseminated through responses to letters, news releases, public announcements, and technical reports. Other vehicles for sharing information are exhibits, briefings, workshops, and meetings. In some cases, States and citizens have used the Freedom of Information Act as a means to obtain specific data or copies of letters.

Issue

Some persons felt that the DOE's ability to supply information to the public will be limited by the acceptance of defense waste in the repository.

Response

The acceptance of defense waste for disposal (see Section C.2.6.1) will not affect access to information or opportunities for public comment. Information on the quantities, characteristics, and environmental impacts of the defense waste is not classified.

Issues

Persons gathering information about the sites allegedly did not identify themselves as DOE employees or contractors.

Response

The DOE's policy is for its employees and contractors to clearly identify themselves when requesting information. The DOE or its contractors have not deliberately misrepresented the objectives of gathering information and would appreciate being informed directly of the specific dates and events when such misrepresentations were made.

C.2.1.2 Interactions with States, affected Indian Tribes, and local communities

C.2.1.2.1 Interactions with States

A number of commenters said that the DOE needs to set up better mechanisms for working with States and notifying them about the program. Others asked how the DOE intends to comply with existing State regulations. In addition, the DOE was asked to give Oregon affected-State status.

Issue

Commenters said that the DOE needs to develop better mechanisms for working with States, rather than simply assuming that States will agree to the DOE's suggestions.

Response

As explained in Chapter 4 of Part I in Volume 1 of the Mission Plan (DOE, 1985a), the establishment of mechanisms for working with States is an important objective of the DOE's institutional program. The DOE has worked closely with the representatives of every State that has a potentially acceptable site for the first repository. Futhermore, informal meetings with first-repository States and discussions with the second-repository States have been initiated. These meetings are intended to give the States additional opportunities to express their concerns and to participate in the development of the repository program. The DOE will continue to attempt to secure smooth working relationships.

Issue

Some States contended that they have not been notified in sufficient time, are not consulted, and their requests for information are not acknowledged or satisfied.

Response

Since the identification of the States with potentially acceptable sites for the first repository, the DOE has tried to consult with them on various siting issues. An example is the extensive consultation process on the siting guidelines, which involved both meetings with individual states and plenary sessions with the first- and second-repository States as well as the submittal of several drafts of the guidelines for State review. This process is described in the "Supplementary Information" for the DOE's siting guidelines (DOE, 1984c).

Although the DOE has made a concerted effort to provide full information to the States, it recognizes that information has not always been provided promptly. The DOE is trying to improve its capability to provide timely responses and is developing program data bases specifically for that purpose. If the States so desire, procedures for providing information may be specified in consultation-and-cooperation agreements.

Consultation and cooperation between the DOE and States is a dynamic process; it will not be limited to activities specified in the consultation-and-cooperation agreements. Further information about the consultation-and-cooperation process can be found in Chapter 4 of Part I of Volume I and in Chapter 3 of Part II in Volume I of the Mission Plan (DOE, 1985a).

Issue

One party recommended that the DOE conclude consultation-and-cooperation agreements with States to provide a formal structure for information and comment.

Response

To ensure that States are actively involved in the program, a formal consultation-and-cooperation process will be established through the written agreements provided for in Section 117(c) of the Act. High priority has been placed on concluding these agreements promptly. No formal consultation-and-cooperation agreements have yet been signed with any State, although negotiations have been initiated with the State of Washington.

In the absence of a consultation-and-cooperation agreement, the DOE will continue to provide both information and opportunities for comment.

Issue

Some commenters felt that the States should have been part of the EA process from the beginning and that the EAs could have benefitted from their involvement.

Response

The States with potentially acceptable sites were asked to participate very early in the EA process, starting with the scoping hearings held early in 1983. Subsequently, the DOE shared various drefts of the EAs with these States. The EAs did indeed benefit from the careful reviews performed by the States, and the DOE is grateful for their thoughtful comments.

Issue

Some States expressed concerns about the DOE's plans for compliance with State regulations in the siting process.

Response

The DOE intends to comply with the substance of any applicable State and local regulations that are consistent with its responsibilities under the Act.

The applicable regulations will be identified in consultation with the affected States and local governments. One of the objectives of the consultation process (see Section C.2.1.2) will be to identify which State or local regulations are applicable to a particular siting, construction, or operation activity and are consistent with the DOE's responsibilities under

the Act (i.e., do not include onerous reporting requirements or entail unacceptable delays). Another objective will be to agree on the mode or the extent of compliance. For the repository program, this consultation process is to begin immediately after the Presidential approval of the three sites recommended for characterization.

Issue

Several States oppose the siting of a repository within their borders.

Response

The Act outlines the process to be followed in the event that the Governor or the legislature of the State opposes the selection of a site in its borders for development as a geologic repository. The Act encourages the DOE to work closely with States in advance of recommendation and to develop a technical program that is credible to the State. However, the Act also provides the opportunity for the State to issue a notice of disapproval, with explanation, at the time that a site in that State is recommended for a repository (Section 116(b)(2)). Such disapproval can be overridden only by a joint resolution of Congress.

Issue

Some States felt that they should have the right to comment or concur on the DOE's plans without losing their rights to issue a notice of disapproval.

Response

The Act empowers a State with a site selected for a repository to submit a notice of disapproval to Congress. This right is not affected by previous comments on the site-selection process. Indeed, States are encouraged to submit comments throughout the process and to provide suggestions to improve the technical quality of the program.

Issue

Some comments urged that States be given the authority to monitor and review activities at every step of the process.

Response

The DOE has been encouraging States to participate in the siting process for more than 5 years through regular interactions with designated representatives. Consultation-and-cooperation agreements will allow each State and affected Indian Tribe to identify and describe in more detail the rights and responsibilities of the parties to each agreement. The agreements can include provisions for States to monitor and review program activities.

Issue

The State of Louisiana expects the DOE to honor the memorandum of understanding that grants the State veto power over any DOE plans for a repository. The agreement was signed February 27, 1978.

Response

The DOE has always maintained the position that the memorandum of understanding between the DOE and the State of Louisiana is valid consistent with the provisions of applicable law. However, if Vacherie Dome in Louisiana were clearly the best site, the DOE, being committed to implementing the Act, would recommend the site to Congress for development as a repository. At that time, Louisiana, like any other State, would have the opportunity to issue a notice of disapproval. The memorandum of understanding was signed before the enactment of the Act, which gave States the opportunity to veto the selection of a site within their borders; the Act supersedes prior agreements.

Issue

One commenter pointed out that a request by the Washington State legislature that granite be considered for the first repository was ignored by the DOE.

Response

The Act required the DOE to identify the potentially acceptable sites for the first repository within 180 days after the Act was passed. Studies of granite had not progressed to the point where the DOE could identify potentially acceptable sites in granite for the first repository. Granite is, however, being considered for the second repository.

Issue

The DOE was asked how it would respond to such State initiatives as Mississippi's statement that it is the policy of the State that radioactive waste may not be stored in Mississippi or the Oregon measure, passed by a ballot, requiring that there be no postclosure releases of radioactive material. Similarly, several comments from communities in Nevada said that their governing bodies had passed resolutions voicing opposition to waste transportation through these communities and to the siting of a repository in Nevada.

Response

The DOE intends to comply with all State regulations consistent with its responsibilities under the Act. However, in some instances State or local legislation that attempts to directly regulate the repository program may not be permissible under the U.S. Constitution.

Issue

According to some comments, Oregon should be recognized as an affected State and be accorded the rights and privileges of an affected State because of its proximity to the Hanford site and to the potentially affected Columbia River.

Response

Because none of the potentially acceptable sites is located within its borders, Oregon is not eligible under the Act for the rights and privileges of an affected State. Nonetheless, Oregon has participated actively in the site-selection process. It has appointed both a Hanford repository review committee composed of State officials and a citizens advisory committee to provide review from a public perspective. Recognizing the high level of interest among local citizens, the DOE held a public hearing on the EAs in Portland on March 11, 1985, and will continue to seek comment from the State of Oregon.

C.2.1.2.2 Interactions with affected Indian Tribes

Issue

Some commenters said that the DOE had not considered the religious attitudes of the Indians toward their land and the effects of site characterization on Indian lands. The Western Shoshone Indian Nation requested that it be declared an affected Tribe and that its tribal council be consulted before the start of any site-characterization activities at the Yucca Mountain site in Nevada.

Response

The DOE recognizes the importance of Indian religious and cultural resources and has specifically included proximity to significant Indian resources, such as major religious sites, as a potentially adverse condition in the siting guidelines.

The Western Shoshone Indian Nation requested affected-Tribe status because it claimed ownership of the land on which the Yucca Mountain site is located. The Federal Government's position that the Shoshone Tribe does not own the land was upheld by the Supreme Court (United States vs. Mary Dann and Carrie Dann, 105 U.S. Supreme Court 1058, February 20, 1985). The Tribe will be able to interact with the DOE through the public comment and interaction process.

C.2.1.2.3 Working with local communities

Issue

Several comments suggested that local communities should have more input and involvement in the siting process and in the development of the waste-management program.

Response

The DOE plans to continue working with both State and local governments during the siting process. The DOE intends to continue holding public meetings and outreach programs for local leaders and the general public in the

vicinity of potential sites and to keep State officials informed of such activities. Although not required by the Act, procedures for local-government representation could be included in consultation-and-cooperation agreements.

The DOE plans to encourage the participation of local community representatives in assessing the potential socioeconomic impacts of a repository, in developing plans to avoid or mitigate significant adverse impacts, and in preparing the impact-identification report that the State is to submit with its request for mitigation assistance. States will be encouraged to provide for and support such local participation.

The DOE is developing policies for providing financial assistance to support local participation in the program either through the State or, if necessary, by direct means. If the State government has established mechanisms for direct local participation and financial support for local efforts, the DOE will provide adequate funding to the State agency responsible for implementing local participation. Where the State government does not provide for direct local participation and support, the DOE will work directly with local representatives to assess potential impacts and may provide direct funding to units of local government.

The DOE meets frequently with local officials and other interested parties for exchanges of views and information.

DOE information offices in communities near the sites under consideration are walk-in sources of information. They provide answers to questions and educational materials. These offices also serve as libraries for public documents and short films, as well as places for the public to submit comments and questions about the program. (See Appendix B for the locations of these offices.)

Issue

Most people in Beatty, Nevada, want Yucca Mountain to be the selected site because of the economic benefits to the area, but the Governor responded negatively, overriding the desires of the citizens closest to the potential site.

Response

The DOE is aware that the interests of local citizens and the State may conflict, but will not intervene in intrastate political or economic disputes. Nonetheless, the DOE welcomes the input of local citizens in the waste-management program and will seek their participation through provisions in consultation-and-cooperation agreements with the States and through the socioeconomic impact assessments that will be conducted concurrently with site characterization.

C.2.1.2.4 Financial assistance

Several States and localities requested information about the distribution and availability of financial assistance. Some States complained that the grants they received for EA review were late; others requested funds to conduct independent technical studies. Several comments were concerned with grants to local communities or private organizations.

Issue

The DOE should provide information about the purpose, timing, and distribution of grants.

Response

The Act authorizes the DOE to provide financial assistance to States and affected Indian Tribes for (1) participation in the repository program and for facilitating effective public participation (2) participation in the consultation-and-cooperation process (see also Section C.2.1.2.1); and (3) the mitigation of socioeconomic impacts. To date, all six States considered for the first repository and three affected Indian Tribes have been awarded grants for participation in the program. In fiscal years 1983 and 1984 a total of $2,157,301 and $4,590,356, respectively, was awarded. Grants also have been extended to the 17 States being considered for the second repository to enable them to participate in site screening. In fiscal years 1983 and 1984, these awards totaled $930,376 and $2,942,186, respectively. Grants allow States and affected Indian Tribes to review and comment on documents, like the technical reports, the siting guidelines, the draft EA, and the Mission Plan and to participate in program meetings and workshops.

The nature and level of grants for the mitigation of socioeconomic impacts will be largely based on the socioeconomic-impact reports that States or affected Indian Tribes will submit and on discussions and negotiations between the DOE and States, affected Indian Tribes, and communities. Both financial and technical support will be provided for the development of such reports. This support can assist States and affected Indian Tribes in examining the public health and safety, environmental, social, and economic impacts of a repository. Also provided for the mitigation of fiscal impacts will be grants equal to the taxes that would be collected if the repository were a commercial project. (See Section C.2.1.5.1 for comments and responses on the mitigation of socioeconomic impacts.)

The DOE will work with States, affected Indian Tribes, and localities to develop impact-mitigation plans in response to the siting of a repository. These plans will address ways to augment community services as well as ways to minimize socioeconomic disruptions and maximize the benefits of new economic activity related to program activities.

Issue

Some State grants for the review of the draft EA were allegedly late, and they were smaller than requested.

Response

All requests for financial assistance from States or affected Indian Tribes are reviewed for conformance to the DOE guidelines on financial assistance. These guidelines ensure compliance with the requirements of the Act as well as consistency and equity among States and Indian Tribes. Once the DOE has reviewed the request, negotiations with the State can begin. Sometimes these negotiations can be lengthy. Delays have occurred when a request lacked key information or when States requested funds for activities outside the scope of the Act or the DOE financial assistance guidelines.

The amount of a grant is decided case by case, but each request is evaluated against similar requests from other States and Indian Tribes. Once the DOE obtains all the information necessary and discusses it with the State, adequate funding levels are determined and awarded. Interim funding is often extended if a grant is delayed.

Issue

Several States asked for funds to conduct independent technical assessments, both for developing new information and for checking the DOE's analyses. Some States alleged that requests of this type were turned down by the DOE.

Response

The Act requires the DOE to provide financial assistance to States or affected Indian Tribes "to engage in monitoring, testing, or evaluation activities with respect to site characterization programs with respect to such site." The DOE's guidelines on financial assistance also extend this funding to phase II (i.e., States and Tribes that have potentially acceptable sites, but have not yet been notified of their status as candidate sites). The DOE had interpreted the Act to mean that activities thus funded should focus on independent monitoring, testing, and evaluation of DOE data.

On December 2, 1985, the Court of Appeals for the Ninth Circuit ruled that the DOE is required under the Act to fund States and Indian Tribes to conduct pre-site characterization studies involving primary data collection if such studies "would be essential to an informed statement of reasons explaining why [the State/Indian Tribe, if on tribal land] disapproved the recommended repository sites" and if the ability of the studies to contribute to the statement of reason "depends on their being initiated prior to site characterization" (State of Nevada vs. Herrington, (No. 84-7846). The DOE is revising its financial assistance guideline in accordance with this ruling.

Issue

Local communities want to share in the grants available under the Act.

Response

Financial assistance to local governments is addressed in Section 4.12 of Part I, Volume I, of the Mission Plan (DOE, 1985a):

> The DOE will continue to provide grants and other financial assistance, as appropriate, to States, affected Indian Tribes, and others to facilitate effective public participation in the program. In addition, the DOE will seek ways to encourage the involvement of other interested parties through grants and other technical or financial assistance.... The DOE will also seek ways to facilitate effective participation by units of general local government that may be affected by program activities.

As already mentioned, the DOE is developing policies for providing financial assistance to support local participation in the program. If the State government has established mechanisms for direct local participation and financial support for local efforts, the DOE will provide adequate funding to the State agency responsible for implementing local participation. Where the State government does not provide for direct local participation and support, the DOE will work directly with local representatives.

Issue

One party said that requests by a private organization for funds to develop balanced information have been denied by the DOE.

Response

The DOE provides financial assistance to national and regional organizations that represent an extension of State and Tribal interests to facilitate their participation in the waste-management program. The organizations that have received such grants are the National Congress of American Indians, the National Conference of State Legislatures, the Western Interstate Energy Board, and the Southern States Energy Board. Where such organizations are likely to improve coordination or the involvement of affected parties, future funding will be provided.

C.2.1.3 Working with other Federal agencies

A number of commenters addressed the participation of other Federal agencies in the repository program. Most of them were interested in the roles of the Nuclear Regulatory Commission and the Department of Defense. (See also Section C.2.2 for comments and responses about the regulations of Federal agencies.)

Issue

A commenter alleged that too many Federal agencies are involved in the siting process. Another suggested that it is vital that agencies whose primary concern is public safety be involved in developing the repository.

Response

The management of spent fuel and high-level waste requires the participation of many agencies of the Federal Government because of their regulatory responsibilities. The Act assigns lead responsibility to the DOE, but significant roles are expected for the following other agencies:

- The Nuclear Regulatory Commission.
- The Environmental Protection Agency.
- The Department of Transportation.
- The Bureau of Indian Affairs.
- The Bureau of Land Management.

- The U.S. Geological Survey.
- The U.S. Army Corps of Engineers.
- The Advisory Council on Historic Preservation.

More-detailed information about the roles of these agencies can be found in the DOE's Project Decision Schedule (DOE, 1985b).

Issue

Information about the involvement and responsibilities of the Nuclear Regulatory Commission and the Department of Defense was requested by several commenters.

Response

The DOE must obtain from the Nuclear Regulatory Commission (NRC) concurrence on the siting guidelines, a license to construct the repository, a license to receive and possess the waste at the site (i.e. to operate the repository), and subsequent license amendments for the closure and decommissioning of the repository. The NRC also will issue site-characterization analyses based on the DOE's site-characterization plan for each site approved for characterization. The NRC licensing process is based on the procedures and the technical criteria issued as 10 CFR Part 60 (NRC, 1983). The objective is to implement the standards set by the Environmental Protection Agency for waste isolation in geologic repositories and thus provide reasonable assurance that geologic repositories will isolate the waste for at least 10,000 years without posing undue risk to public health and safety. Since 10 CFR Part 60 was issued before the Act was passed, the NRC is revising it for compliance with the Act; 10 CFR Part 60 may also change in response to the Environmental Protection Agency's final environmental standard (40 CFR Part 191), which was published on September 19, 1985 (EPA, 1985).

The Department of Defense is involved in the program through the U.S. Army Corps of Engineers, which is advising the DOE on the acquisition of private lands.

Issue

One party stated that the DOE should complete consultation with the U.S. Fish and Wildlife Service on threatened and endangered species before proceeding with site recommendation for characterization.

Response

The DOE has been communicating with the U.S. Fish and Wildlife Service on designated critical habitats and the possibility of threatened or endangered species occurring at any of the sites. In response to specific concerns about the presence of protected species at the Davis Canyon site, the DOE participated with interested agencies and individual experts in a field survey conducted in July 1985. When a site has been selected for repository development, the DOE will enter into a formal consultation with the Service. Until then, the DOE will remain in contact with the Service and with State agencies regarding protected species.

C.2.1.4 Working with other countries

Issue

Because the disposal of radioactive waste is an international problem, the DOE should seek technical assistance and independent scientific analyses from other nations that do not have a vested interest.

Response

It has long been U.S. policy to cooperate with other nations in developing waste-management technology. As described in the Mission Plan (DOE, 1985a, Volume I, Part I, Chapter 5), the DOE actively participates in international cooperation and information exchange through bilateral agreements, multinational activities, and international forums and programs. These activities are part of the DOE's overall program under current agreements with Belgium, Canada, France, the Federal Republic of Germany, Japan, Sweden, Switzerland, the United Kingdom, the Commission of European Communities, the International Atomic Energy Agency, and the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development. The DOE is currently most active in joint projects with Canada, Germany, Sweden, and the NEA. These projects include (1) an underground crystalline-rock research laboratory in Canada; (2) ongoing tests in the Asse salt mine in Germany; and (3) tests in the Stripa mine in Sweden, which are being performed in crystalline rock.

C.2.1.5 Socioeconomic impacts

This section covers two topics that drew many comments: (1) socioeconomic impacts and their mitigation and (2) the acquisition of laws and effects on property values.

C.2.1.5.1 Socioeconomic impacts and their mitigation

Many comments, from the States, local communities, and the public, addressed various issues related to the socioeconomic impacts of a repository and their mitigation. Some of them alleged that the DOE had not adequately involved local communities in assessing the effects and did not understand local values. Others were concerned about the timing and adequacy of mitigation grants.

Issue

Some comments said that the DOE has not adequately involved the citizens of local communities in evaluating the effects of a repository on local people, businesses, and services.

Response

The DOE will conduct socioeconomic studies that will involve local communities and will collect information from local sources (schools, local officials, etc.). These studies will be conducted concurrently with site characterization and will be much more detailed than the preliminary assessments included in the EAs.

Some socioeconomic impacts, such as increased demands for public services, will affect local governments directly. For this reason, the DOE will encourage the participation of local governments in the preparation of the socioeconomic-impact reports as early and as fully as possible. The DOE will encourage the States to allocate of a portion of their grant to affected localities.

Issue

The DOE allegedly does not understand and appreciate the values of the local communities at the sites that are being considered.

Response

After the President approves the sites recommended for characterization, the DOE will begin detailed studies of the demographic and social and economic conditions in local communities, collecting information from local sources. These studies will examine the effects of the repository on the local economy, community services, housing, and the like. Transportation-related effects on local communities will also be analyzed. Local communities will continue to have opportunities to be directly involved in the assessment of socioeconomic effects, and their officials will be asked to provide information not only about local economic and social conditions but also about the attitudes of the community.

Issue

The EAs should include more information in Chapter 5 about the financial impacts of site characterization and repository development on local communities and the grant programs applicable to individual sites.

Response

Chapter 5 of the EAs has been revised to provide more-detailed information about socioeconomic effects. Information about grants is available in the Mission Plan (DOE, 1985a, Volume I, Part I, Chapter 4).

Issue

Some persons said that there is no guarantee that the local economy and local employment picture will improve because of the presence of a repository. On the other hand, one commenter noted the economic benefits that could accrue from a repository nearby and wanted assurances that the residents of the local community would have job opportunities. He said that the local business community saw the repository as being beneficial as long as the "boom-and-bust" cycle can be broken.

Response

Although there may be no guarantee of an improvements in the employment situation, such improvements are likely because of improvements in the local economy. Federal procurement law requires the DOE to advertise for, accept bids from, and hire contractors on the basis of competitive bids. However, the DOE will make available to local businesses complete descriptions of the required contract work and will meet with local leaders to describe the project. Where possible, the DOE and the general site contractor may divide contracts into smaller subcontracts to facilitate bidding by local contractors. This approach is being successfully used for the Waste Isolation Pilot Project in New Mexico. Furthermore, local residents may find employment with any outside contractors that may be hired. The DOE will also widely publicize locally business and job opportunities and work with community leaders to provide contract-procurement workshops and vocational training programs.

The DOE plans to take mitigative measures to reduce the impacts of the "boom-and-bust" cycle--the buildings and eventual reduction in local populations that will result from siting a repository in a rural area.

Issue

Some States and communities indicated that mitigation efforts and funds must precede or be concurrent with program activities to avoid adverse impacts. In particular, some potentially affected communities expressed concern that the need to improve community services may occur before impact-mitigation funds are distributed.

Response

The Act does not provide for impact-mitigation funds before repository construction begins, but the Act does allow grants equal to taxes to be provided to units of general local government beginning with site characterization. The DOE will therefore work with States, affected Indian Tribes, and local governments to minimize or avoid adverse impacts and to identify mechanisms for the timely provision of assistance within the authorization provided by the Act. Financial assistance will be provided to States and affected Indian Tribes throughout the construction and operation phases to enable them to mitigate repository-related impacts.

Issue

Some parties were concerned that the grants will be cut and thus will not provide adequate assistance (i.e., the grants will not be equal to the amount lost in the reduced assessments of the value of surrounding land and will not make up for taxes lost as a result of business relocations).

Response

The levels of impact-mitigation funding will be based on assessments of potential impacts, in which local communities will be encouraged to participate. The funding levels agreed on will be based largely on the socioeconomic-impact reports that will accompany the requests of States and

affected Indian Tribes for financial assistance. Included in the impact-mitigation assistance will be grants equal to taxes.

In general, applications for grants will be submitted by the State or the affected Indian Tribe to the appropriate DOE Project Office. The DOE will process these applications as quickly as possible under Federal procurement regulations. When agreement on terms has been reached by the DOE and the State or affected Indian Tribe, the grant will be awarded.

Issue

Commenters requested that the DOE furnish temporary housing for transient workers during site characterization.

Response

With the exception of the Davis Canyon site, adequate housing is expected to be available in the vicinity of the nominated sites during site characterization. The DOE may consider providing temporary housing at the Davis Canyon site if the site is recommended and approved for characterization.

C.2.1.5.2 Land acquisition and property values

The subject of land acquisition and property values was raised by many commenters, who expressed concern about decreases in property values, fair compensation for land acquired from private owners, the uncertainty resulting from a long site-selection process, and similar issues.

Issue

A number of persons expressed concern about the effects of site characterization and repository development on property values. Some made suggestions about the approach to compensation; others wanted to know what the DOE considers reasonable compensation. Some said that the value of property near a site being considered for a repository has already decreased and will continue to plummet as the process continues, but that compensation should be based on the nondepreciated land values that could be expected without the repository project.

Response

The DOE recognizes that some people believe that the value of some lands at or near a potential repository site may have decreased, but there is no concrete evidence of such decreases. However, for the sites that are not recommended for characterization, it can reasonably be expected that property values, if decreased, will return to normal once the site is removed from consideration. At the sites recommended for characterization, private land may be leased or purchased for the characterization phase. If there is private land at a site selected for a repository, the DOE will acquire the land through purchase, at fair market value.

All land-acquisition activities will be performed in accordance with the Uniform Relocation Assistance Act. The DOE will ask for assistance from the U.S. Army Corps of Engineers in the acquisition process because of its extensive experience. The Corps will assess the value of the land, basing the assessments on the value of land that is similar but outside the immediate area. This approach will ensure that the assessment is not reduced by any land-value decreases that may result from the repository project.

Issue

One commenter suggested that a one-mile buffer zone should be established around the site, within which owners could choose to keep their property with compensation from the DOE for its devaluation or sell to the DOE under the same terms as those offered for land at the site.

Response

Land values will be assessed during the studies that will be conducted concurrently with site characterization. At this time the DOE has made no decision about establishing a buffer zone or how compensation in a buffer zone will be handled. If the siting of a repository causes a clearly demonstrated adverse effect on the values of the surrounding land, impact-mitigation funds may be made available as compensation.

Issue

Some felt that landowners who have already sold property at prices depressed by repository siting should be compensated for their losses.

Response

The DOE will examine case by case any claims from landowners who feel that they have received a depressed price for their property because the land is or was being considered for a repository.

Issue

The DOE was asked to issue a specific statement explaining what it considers reasonable mitigation and compensation for relocation.

Response

In providing relocation assistance, the DOE will follow the procedures specified in the Uniform Relocation Assistance Act. Information about relocation procedures has been distributed at meetings of landowners in the Deaf Smith site and is available from the DOE.

Issue

Some commenters urged the DOE to decide on a site as soon as possible because otherwise people cannot make decide about making necessary improvements to their property and do not know whether their lives will be disrupted. One party said that the DOE should "stop casting a cloud" on land titles near potential sites. Another commenter said that the DOE should develop a mitigation policy of indemnifying local citizens against uncertainty.

Response

The siting of a repository requires extensive and detailed study to collect sufficient information and must follow the process outlined in the Act. Therefore, it is not possible for the DOE to decide now which site will be selected. This choice will be made several years from now. However, the DOE believes that landowners should not base decisions about improvements to their property on the anticipation of a repository. If the land is acquired, landowners will be compensated at fair market value, including any improvements that have been made.

Issue

The DOE should arrange an exchange of land with the Bureau of Land Management rather than condemning private farmland for the repository.

Response

The DOE recognizes that the acquisition of private land may have significant impacts on its owners and will follow the provisions of the Uniform Relocation Assistance Act. However, in selecting a site for a repository, the ability of the site to contain and isolate the waste is more important than current land use.

C.2.2 LEGAL AND REGULATORY ISSUES

Most of the issues raised in comments on legal and regulatory matters were concerned with the EPA standards for geologic disposal. Other issues included emergency response responsibilities, liability for accidents, and the applicability of Federal mining regulations.

Issue

Several commenters asked which Federal agencies set standards for radioactive-material releases from the repository.

Response

The Act (Section 121(a)) directs the Environmental Protection Agency (EPA) to develop standards for protecting the general environment from radioactive-material releases from repositories. Responsibility for implementing the EPA standard is assigned to the Nuclear Regulatory Commission (NRC).

The EPA standards were issued in final form as Title 40 of the Code of Federal Regulations, Part 191 (40 CFR Part 191), on August 15, 1985; they were published in the Federal Register on September 19, 1985 (EPA, 1985), and became effective on November 18, 1985. The NRC criteria for implementing these standards were issued as Title 10 of the Code of Federal Regulations,

Part 60 (10 CFR Part 60). They were published on June 21, 1983 (NRC, 1983). Since 10 CFR Part 60 was issued before the Act was passed, the NRC is revising it for compliance with the Act; 10 CFR Part 60 may also change in response to the above-mentioned final EA standard (40 CFR Part 191).

Issue

A number of comments pertained to the postclosure safety of the repository. Some of them asked what levels of radiation are harmful and who determines what levels are not harmful and what is considered to be an acceptable death rate. One commenter objected that in the absence of individual dose standards, the EPA's population standard is unacceptable.

Response

According to the National Council on Radiation Protection and Measurements (1974), the lowest radiation doses that produce evidence that a person has been affected by radiation are in the range of 75 to 125 rem, which is the "minimal dose likely to produce vomiting in about 10 percent of people so exposed." The individual dose limits set by the EPA for the repository are more than 1,000 times lower. During repository operations, no member of the general public may receive more than 25 millirem (0.025 rem) to the whole body, 75 millirem (0.075 rem) to the thyroid, and 25 millirem to any other critical organ; during the first 1,000 years after closure, the limits are 25 millirem the whole body or 75 millirem to any critical organ. The EPA estimates that, for the first 10,000 years, releases from a repository containing 100,000 MTU of waste would cause no more than 1,000 premature deaths from cancer, or an average of no more than one death every 10 years. The projections for actual repositories are expected to be about 10 times lower. For comparison, it is estimated that about 6,000 premature cancer deaths per year are caused by natural background radiation (radiation from cosmic rays, the rocks in the earth, etc.).

In its final standards, 40 CFR Part 191, the EPA has included individual protection requirements (40 CFR 191.15), which are expressed as the maximum permissible individual dose for 1,000 years after repository closure.

Issue

A few commenters questioned the 10,000-year standard for waste isolation.

Response

The 10,000-year standard was chosen by the EPA because at 10,000 years after repository closure the risk posed by the repository to public health and safety is comparable to the risk from unmined uranium ore.

Issue

Some parties expressed concern that the final EPA standards had not been promulgated at the time the draft EAs were issued.

Response

As already mentioned, the final EPA standards were published on September 19, 1985. These final standards were used in revising the EAs.

Issue

One commenter asked who would be responsible for responding to emergencies during repository operation and waste transportation.

Response

The DOE is responsible for emergency preparedness and response at the repository, as specified in DOE Order 5500.3 ("Reactor and Non-Reactor Facility Emergency Planning Preparedness, and Response Programs for Department of Energy Operations").

Responsibility for emergency preparedness and response in the event of a transportation accident involving radioactive materials is spread among the DOE, the carrier of the waste, and the Federal, State, and local governments. The carrier of the waste has the initial responsibility for "onsite" activities to minimize the hazards to life and property from a possible spill of radioactive materials. State and local governments have the primary responsibility for emergency measures that must be undertaken to protect persons, property, and the environment on lands within the State's boundaries from the threat of harm from an accident involving the transportation of nondefense radioactive waste. Upon request by State or local authorities, the DOE and the Federal Emergency Management Agency will provide assistance in responding to emergency situations. (The DOE's personnel will also respond to emergency-assistance requests from private persons and companies, including transportation carriers.)

In regard to emergency response at the Hanford and the Yucca Mountain sites which are Federal nuclear reservations, any onsite accidents would be the DOE's responsibility, not that of the State or the local jurisdiction.

Issue

Commenters questioned the extent of the Federal Government's liability in case of a transportation accident or an accident at the repository in light of the Price-Anderson Act, which limits coverage to $570 million. They claim that the sum is inadequate and that the Federal Government must assume 100 percent liability in the case of an accident. The failure to address this indicates the government's unwillingness to realistically address the risks associated with the repository.

Response

The Price-Anderson Act provides liability for damages suffered by the public in the event of nuclear accidents at certain facilities, including DOE contractor-operated facilities. The Price-Anderson Act is now under Congressional review, and the Secretary of Energy has made recommendations for extending liability coverage for activities carried out under the Act. (See Appendix A of the EAs for a more detailed discussion.)

Issue

One commenter wanted to know whether DOE contractors are subject to the Mine Safety and Health Act.

Response

The DOE is not subject to the requirements of the Mine Safety and Health Act but intends to comply with its provisions in the repository program. The decision to construct two exploratory shafts (rather than one) at each site recommended for characterization was based partly on compliance with this regulation.

Issue

One commenter asked whether a repository would be excluded from "public health scrutiny" under the Atomic Energy Act of 1954.

Response

Under the Atomic Energy Act of 1954, all facilities in the commercial nuclear fuel cycle, including repositories, are subject to licensing by the NRC, and for this purpose the NRC has promulgated regulations whose objective is to protect the health and safety of the public. For a repository, NRC licensing is also required by the Act, which also stipulates that geologic disposal must be safe and environmentally acceptable.

C.2.3 PROGRAM MANAGEMENT, COSTS, AND SCHEDULES

Included in the comments on the draft EAs were a number of comments on program management, costs, and schedules. The DOE's schedule for repository siting and development was of concern to many parties, most of whom urged the DOE not to sacrifice excellence for schedule.

C.2.3.1 Program management

The comments on program management were concerned mainly with the potential for conflicts of interest in DOE contractors, peer review of the technical program, the need for a program plan, and assurance that DOE contractors will take the necessary measures to protect the environment.

C.2.3.1.1 Conflicts of interest

Issue

Some commenters stated that contractors with a high financial stake in repository development should not perform analyses for site evaluation. Many commenters suggested that, out of the wide range of available data, the contractors choose to analyze only the data that favorably depict the site. The DOE should either employ different contractors for the analysis of site

data or allow the current contractors to continue with site-data analysis of with the stipulation that they will not be considered for prime-contractor positions for repository construction or operation.

Response

Conflict of interest is a potential problem in any large program where individuals and organizations may have a long-term vested interest in the continuation of the program. However, the repository program is divided into several major phases, and the contracts now in effect are limited to the current phase only (development and evaluation). Furthermore, the contracts of the major support contractors are opened for bids every 5 years. Because of the different skills and experience that will be required for repository construction and operation, many of the contractors for these phases are likely to be different from those involved in site evaluation.

There is little likelihood of biased analyses because the analyses conducted for site evaluation are reviewed by the DOE Project Offices, peer review groups, independent experts hired by other DOE organizations (e.g., the Office of Environmental Compliance, which is under the Assistant Secretary for Environment, Safety and Health), other Federal agencies, and technical experts hired by the States. Documents important to the siting process, such as the draft EAs and the environmental impact statement, are submitted for review by the public. The draft EAs were also reviewed by the Nuclear Regulatory Commission, the U.S. Geological Survey, and the National Academy of Sciences. Finally, the ultimate decision on the suitability of a candidate site will be made by the Nuclear Regulatory Commission, which is continuously reviewing the DOE's work through its staff and consultants.

C.2.3.1.2 Technical peer review

Issue

Several comments referenced a report by the General Accounting Office (GAO) report, issued January 10, 1985, that concluded that the program lacks consistent peer review and that this lack may ultimately subject the DOE's technical analyses to challenges and revisions.

Response

Peer review is an important part of the process by which a repository is sited, constructed, and operated. Peer-review groups have already participated in the early stages of the process. For example, the DOE has assembled a group of independent experts, the Performance Assessment National Review Group, to examine the performance-assessment work of the first repository projects. As the repository program continues, the OCRWM expects to assemble similar groups to examine other parts of the work. Other DOE organizations--for example, the Office of Environmental Compliance--also use independent experts in their review of work sponsored by the OCRWM; their peer reviews are significant contributions to the program. The DOE Project Offices also employ peer review groups in many of the technical aspects of the program.

The States in which a repository may be located also provide independent peer reviews; some of the funds distributed by the DOE as financial assistance to the States are used for that purpose.

Another source of independent peer review is the National Academy of Sciences. This organization has contributed a review of the draft EAs and is expected to contribute further reviews in the future.

The ultimate peer review of the program will be provided by the Nuclear Regulatory Commission. Through its staff and consultants, the Commission will continuously review the DOE work, as it already has the siting guidelines and the draft EAs.

C.2.3.1.3 Need for program plan

Issue

A commenter said that the DOE needs a program plan for waste disposal.

Response

The DOE issued the draft Mission Plan for the Civilian Radioactive Waste Management Program in April 1984 (DOE, 1984a) and the revised plan in June 1985 (DOE, 1985). The Mission Plan describes the objectives and strategies of the program, summarizes current program plans, and summarizes the technical status of the program.

C.2.3.1.4 Protection of the environment

Issue

Some commenters said that government contractors will not spend the money to ensure that the environment is protected during the construction of the repository.

Response

The DOE will oversee all construction activities to ensure compliance with Federal environmental regulations. An environmental plan that specifies procedures to be followed will be prepared for the construction project. Potential impacts are discussed in the EAs. A more comprehensive analysis will be presented in the Environmental Impact Statement, which will also discuss measures for mitigating any significant adverse impacts.

C.2.3.2 Program costs

Several commenters inquired about the total cost of repository development, who was responsible for these costs, and whether the cost of defense-waste disposal would be borne by the Federal Government.

Issue

Commenters asked about the total costs of repository development and waste-management activities.

Response

The costs of the Civilian Radioactive Waste Management Program are divided into four major categories: (1) development and evaluation; (2) geologic repository construction, operation, closure, and decommissioning; (3) transportation; and (4) storage. Estimates of costs for each category depend on the assumptions about such variables as the quantity of waste to be emplaced, the minimum "age" of the waste, the host rock of each repository, the repository design receipt rate, the beginning operation date for each repository, the technology used for waste-transportation casks, and the basis for expressing costs. The figures discussed below were taken from Chapter 10 of Part II of Volume I of the Mission Plan (DOE, 1985a), which discusses in more detail the total costs of managing commercial radioactive wastes.

The costs of development and evaluation (D&E) include all the siting, repository design, testing, regulatory-compliance activities, and institutional activities associated with the repository, waste transportation, and monitored retrievable storage (MRS). The current reference case for total D&E costs is $7.8 billion (in constant 1984 dollars).

Repository costs include the costs of construction, operation, closure, and decommissioning. Depending on the host rock, the costs of the first repository may vary from $6.8 billion to $10.7 billion (in constant 1984 dollars) for the reference cases. The repository costs of the second repository may vary from $5.8 billion to $6.1 billion (in constant 1984 dollars).

Waste-transportation costs will be derived from a unit charge for transportation cask use, shipping, and security for each potential transportation pathway. The pathways include transportation from the commercial reactors to each repository, from reactors to an MRS facility (if such a facility is approved by Congress and developed), and from an MRS facility to each repository. The total transportation cost is the sum of these three transportation unit costs. Estimates for transportation costs for the reference cases vary from $3.3 billion to $5.1 billion.

Current planning assumptions for an MRS facility estimate the costs at between $1.6 and $2.6 billion, or about 5 to 11 percent of the estimated costs of a waste-management system without an MRS facility.

Issue

Commenters asked who is responsible for the costs incurred in constructing the repository. How will these costs be covered and who will pay for the program if the nuclear power plant industry dies out before the closure of the repository?

Response

The Act requires the owners and generators of commercially generated radioactive waste to pay the full costs of its disposal and established a Nuclear Waste Fund to ensure the full-cost-recovery funding of the waste-management program. This Fund receives revenues from an adjustable fee charged quarterly for all electricity generated by commercial nuclear facilities beginning April 7, 1983, as well as a one-time fee, estimated to produce a total of $2.3 billion, for radioactive waste produced before April 7, 1983. The revenues generated from these two sources, in addition to interest earned from the investment of any surplus in U.S. Treasury securities, are deposited in the Fund, and disbursements are made to cover costs as the program progresses.

Forecasts of future nuclear power generation are incorporated into the management of the Fund. Representative scenarios are presented in DOE documents describing the adequacy of the fund (DOE, 1985c) and analyzing the total-system life-cycle cost for the program (DOE, 1985d).

Issue

Some commenters wanted to know who is responsible for paying for the disposal of defense high-level waste?

Response

As stipulated in the Act, the Federal Government will cover all costs of defense-waste disposal through contributions to the Nuclear Waste Fund (see also Section C.2.6.1).

Issue

Some commenters noted the need for an independent waste-fund audit.

Response

As required by the Act, the Comptroller General of the United States makes annual audits of the Nuclear Waste Fund and submits reports to Congress. An independent audit is also performed for the DOE by a certified public accounting firm. The latest audit covered the period from January 7, 1983 to September 30, 1984, and the results are summarized in the DOE's Annual Report to Congress (DOE, 1985e).

C.2.3.3 Schedule

Many commenters expressed concern that the DOE's schedule for repository siting and development would adversely affect the selection of sites, the consultation process, and the adequacy of the technical data.

C.2.3.3.1 Dependence of site-selection process on schedule

Many comments contended that the mandated repository schedule is driving the site-selection process. Commenters felt that the DOE's schedule is inadequate in that it is an unrealistic list of dates dictated by political decisions rather than by sound geologic site-screening criteria. They requested that the date for the final site selection be postponed and the number of potential repository sites be increased. (See also Section C.3.4.4 for comments on related issues.)

Issue

A number of commenters requested that the date for the final site selection be postponed and the number of potential repository sites be increased.

Response

Being committed to a schedule that will lead to the receipt of waste in 1998 for emplacement in the first repository, the DOE will make every effort to meet intermediate milestones, such as the selection of the site for the first repository, without sacrificing technical excellence.

As explained in Section C.3, the DOE believes that the number of potential repository sites is adequate and in compliance with the requirements of the Act.

Issue

A commenter requested that the DOE recommend that Congress amend the Act to reduce the time constraints in order to allow sufficient time for the entire process.

Response

The DOE recognizes that its schedule is success oriented, but it is also achievable. Hence, a recommendation for an amendment of the Act is not needed.

C.2.3.3.2 Effects on the consultation process

Issue

One commenter said that the DOE could not stay on schedule and conduct a satisfactory program of consultation and cooperation with States and affected Indian Tribes.

Response

As discussed in detail in Chapter 4 of Part I of Volume I of the Mission Plan (DOE, 1985a), the DOE maintains an ongoing program of consultation and information exchange with the States and affected Indian Tribes. The scope of this program is not determined by the overall project schedule. The DOE will

seek to enter into negotiations with States for written consultation-and-cooperation agreements(s) within 60 days after the approval of sites for characterization.

Issue

Some commenters stated that the DOE's tight schedule means closed decisions and no public input.

Response

Recognizing that the schedule is very tight, the DOE is nonetheless fully committed to a process of open and active consultation with all interested parties (see DOE, 1985a, Chapter 4 of Part I of Volume I). Closed decisions are not in the DOE's interest because the schedule can be met only if the States, Indian Tribes, and the public are confident that the siting decisions are sound.

C.2.3.3.3 Effects on the adequacy of technical data

Many comments about the schedule stated that it did not allow time for adequate scientific study and hence might compromise the site-selection process. One commenter doubted that 5 years was enough time for data gathering during site characterization. Conversely, another party noted that the characterization process should follow the mandated schedule so as not to increase costs.

Issue

Many comments objected that the schedule does not allow sufficient time for adequate scientific study.

Response

The DOE cannot meet the schedule without adequate scientific study because it will not be able to obtain an NRC license unless it can demonstrate that the site can meet the standards of the EPA and the technical criteria of the NRC. Furthermore, the DOE believes that it can meet the schedule without sacrificing technical excellence.

Issue

The reference schedule does not allow adequate scientific analyses during site characterization.

Response

The DOE is confident that the schedule for site characterization is adequate.

Detailed plans for the studies to be conducted will be included in the site-characterization plans, which will be submitted to the Nuclear Regulatory Commission, the U.S. Geological Survey, the States, and the public for review.

The Mission Plan (DOE, 1985a) outlines four alternative cases for site characterization in addition to the reference case. Each case identifies and discusses potential delays. The measures that could be used to compensate for these delays are discussed in the draft Project Decision Schedule (DOE, 1985b).

C.2.4 TRANSPORTATION, RETRIEVABILITY, AND SECOND REPOSITORY

C.2.4.1 Transportation

This section presents general, rather than site-specific, comments on transportation and the analyses presented in Appendix A; these comments are national in scope.

Most of the site-specific comments on transportation pertain to the local and regional transportation impacts of repository operation and are discussed in Section C.7.3. Typical examples of the repository-related transportation comments covered in Section C.7.3 include (1) the impacts of constructing repository access routes, (2) the transportation impacts of repository operation on the local and regional population and environment, (3) the suitability of candidate local and regional transportation routes, and (4) the compliance of the site with the conditions of the transportation guideline.

Many commenters said that the Appendix A should contain more-detailed analyses (e.g., route-specific analysis) and more background information (e.g., legislative and regulatory history). The more-detailed analyses will be performed after the necessary data are collected during site characterization; they will be reported in the environmental impact statement that will accompany the recommendation of one site for development as a repository.

The information provided in the EAs is believed to be sufficient to support preliminary findings on the conditions of the transportation guideline and to discriminate among the sites and is in accordance with the requirements of the siting guidelines (DOE, 1984c). For transportation, the types of information that should be used in nominating sites as suitable for characterization are listed in Appendix IV as follows:

- Estimates of the overall cost and risk of transporting waste to the site.
- Description of the road and rail network between the site and the nearest interstate highways and major rail lines; also description of the waterway system, if any.
- Analyses of the adequacy of the existing regional transportation network to handle waste shipments; the movement of supplies for repository construction, operation, and closure; the removal of nonradioactive waste from the site; and the transportation of the labor force.

- Improvements expected to be required in the transportation network and their feasibility, cost, and environmental impacts.
- Compatibility of the required transportation-network improvements with the local and regional transportation and land-use plans.
- Analysis of weather impacts on transportation.
- Analysis of emergency-response requirements and capabilities related to transportation.

C.2.4.1.1 Cost and risk estimates for transportation

Issue

The transportation cost and risk analyses in the draft EAs were generally considered inadequate by many commenters. Specifically, four main inadequacies were identified: (1) the methods and inputs used were not valid; (2) food-chain and water pathways were overlooked; (3) centroids (i.e., points representing the geographical setting of groups of reactors) were used in lieu of actual reactor locations; and (4) route-specific data were not used.

Response

The DOE believes that the methods and input to the cost and risk analyses are valid and that the results provide an adequate basis for comparing the transportation impacts that would result from shiping waste to each of the sites. However, as discussed below and in Sections C.2.4.1.3, C.2.4.1.4, and C.2.4.1.7, some changes in the methods and input were made. The results of these changes are found in Appendix A.

The RADTRAN II radiological risk code was modified to include the food chain, though the overall impact of this exposure pathway is minor. This change is reflected in the results presented in Appendix A. The relative importance of water pathways can be inferred from similar analyses developed for studies of the risk from nuclear reactors. These studies have examined hypothetical accidents with large radionuclide releases to the environment and have shown that water pathways on the average are small contri- butors to the total health risk from accidents. However, the consequence analysis included in Appendix A does evaluate the radiation doses received from the water pathway. (See also Section C.2.4.1.3.)

In the draft EAs, which considered shipments from reactors to repository only, the sensitivity of the result to the use of centroids rather than individual reactor locations should be small. However, by introducing the MRS facility, the sensitivity may increase. In the final EAs, actual reactor locations were used in lieu of centroids to evaluate the fractions of travel in the various population-density zones because the MRS facility is now included in the analyses. The results in Appendix A reflect this change.

The issue of route-specific analyses is addressed below.

C.2.4.1.2 Route-specific analysis

Issue

The transportation-risk analyses, which were based on national average data, were challenged in many comments as being inadequate and improper for comparing the repository sites. Furthermore, some commenters said that such analyses do not highlight the special impacts on some States through which a large fraction of all shipments to the repository will pass.

Response

The DOE believes that the general methods and national average data used are adequate for this stage of the repository-siting process. Route-specific analyses and an evaluation of the impacts on host States and States along transportation corridors will be included in the environmental impact statement.

The route-specific analyses to be performed in the future will proceed in the following sequence: (1) define important parameters; (2) gather data; (3) develop models as required; (4) perform analysis; (5) consider mitigating measures; (6) report results. Much coordination and cooperation will be required from State governments and Indian Tribes, particularly in the early stages where parameter identification and data gathering will take place.

C.2.4.1.3 Assessment of the consequences of accidents

Numerous comments said that Appendix A should discuss the consequences of accidents that could occur during transportation and recommended that the analysis consider such factors as route-specific anomalies, the cost of emergency response and cleanup, ingestion pathways, and occupational and non-occupational exposures.

Response

The analyses described in the draft EAs were presented in terms of risk, which is the product of the probability of occurrence and the consequences of that occurrence. Consequence analyses had been performed, but their results were used in producing the risk values published and were not presented separately.

For the final EAs, the consequences of accidents were reevaluated, considering the suggestions of the commenters. The results, consisting of both costs and radiation doses, are in Appendix A. The potential impacts of releases to the atmosphere with deposition on land and on a reservoir are evaluated. Also included are the estimated probabilities of the accidents.

Emergency-response and cleanup costs are described in detail in a study prepared for the NRC (NRC, 1980) and thus are not included in the final EAs.

C.2.4.1.4 Maximum exposure of individuals

Several commenters stated that there were plausible scenarios in which an individual would receive more radiation exposure than the maximum dose estimated in Appendix A. Others said that Appendix A should include the maximum exposure received by an individual during an accident.

Response

Elements of the suggestions received have been combined to define a new set of circumstances for estimating the maximum exposure that individuals might receive during shipments to a repository under normal conditions. Similarly, accident descriptions have been developed for estimating the maximum radiation exposure received by a rescue worker and a member of the public. These analyses are presented in Appendix A.

C.2.4.1.5 Modal split for shipments

Several commenters were confused about the percentage of shipments that will occur by truck and by rail. Some analyses assumed that 70 percent of the shipments would be by rail and 30 percent by truck, while most of the analyses assumed for 100 percent by rail or 100 percent by truck. Furthermore, earlier studies were based on 50 percent of shipments going by rail and 50 percent by truck.

Response

Analyses have not been inconsistent. In order to calculate the maximum national impacts of transportation to a repository, two cases were evaluated. One case evaluated the impacts resulting from making all shipments by rail (100 percent rail) and the other from all shipments by truck (100 percent truck). It is expected, however, that during the early years of repository operations rail shipment will be used for no more than about 50 to 70 percent of the total spent-fuel shipments because of the lack of rail spurs at some reactor sites and other limitations. In later years it is expected that reactor capability to ship by rail will be improved, and the fraction of spent fuel shipped by rail will increase to a least 70 percent. In addition, the rail-to-truck ratio will vary from year to year, depending on which reactors are making shipments.

Assumptions of 100 percent by truck and 100 percent by rail will continue to be used, except that for shipments from the MRS facility to the repository only the rail mode will be considered. For national risk and cost impacts resulting from radioactive-material shipments and directly attributed to transportation operations, these cases result in the maximum predicted impact.

C.2.4.1.6 Defense waste

Several commenters stated that the volume of defense waste to be shipped to a repository was understated in the draft EAs. In particular, the EAs only considered the transportation of defense high-level waste from the Savannah River Plant and did not consider transportation from either the Hanford Site or the Idaho National Engineering Laboratory (INEL). One commenter asked about shipping liquid high-level waste.

Response

The final EAs consider shipments of defense high-level waste from the Savannah River Plant, the Hanford Site, and the INEL. Defense high-level waste will not be transported as a liquid nor will separate shipments of krypton-85 or iodine-129 be made.

The transportation of defense high-level waste is discussed in Chapter 5 and Appendix A of the final EAs. This discussion also recognizes that the President has decided that defense high-level waste should be shipped to a civilian repository for disposal; this decision had not been made when the draft EAs were issued.

C.2.4.1.7 Monitored Retrievable Storage

Issue

Some commenters objected that the transportation analysis was inadequate because a facility for monitored retrievable storage (MRS) was not included in the waste-management system considered in the draft EAs.

Response

The MRS facility had not been proposed when the analyses were prepared for the draft EAs. Preliminary transportation analyses indicate that the total number of miles traveled by the cask fleet can be decreased by introducing an MRS facility into the waste-management system. A description of a representative transportation system designed to support the MRS facility was used to estimate transportation costs and risks for a waste-management system with an integrated MRS facility; the results are included in Appendix A. This new analysis supplements, rather than replaces, the analysis for the reference case.

C.2.4.1.8 Barge transportation

Issue

Several commenters objected that the use of barges had not been given any consideration in the transportation risk assessment, calling this a serious deficiency because barge transportation is a discriminator among the potential

candidate sites; some of them felt that this omission was most serious for the Hanford site, which is close to a navigable waterway (approximately 16 miles away).

Response

A discussion of the barge mode is included in Appendix A to the final EAs. The discussion is in two parts: a description of the mode as a feasible alternative that can play a secondary or supplementary role in the transportation of radioactive wastes and a synopsis of a risk and cost study performed by the Argonne National Laboratory (Tobin and Meshkov, 1985) to examine the normal risk of transporting by barge and to examine costs of shipment, including transfers to truck or rail. The set of circumstances considered does not include the shipment of spent fuel from reactors in the East through the Panama Canal to the Hanford site. The discussions explain the premise that barge transport is not a sensitive discriminator among sites, and it is unnecessary therefore to include an exhaustive analysis in the final EAs.

The particular logistics for using barge to transport spent fuel from some reactors near the West Coast to the Hanford site are discussed in the final EA for Hanford.

C.2.4.1.9 Consideration of a second repository

Issue

Some groups were critical of the fact that the EAs did not consider the implications of a second repository on transportation. They postulate that a two-repository system would minimize the overall cost and risk of transportation.

Response

Favorable condition 5 of the transportation guideline is the "total projected life-cycle cost and risk for transportation of all wastes designated for the repository site which are significantly lower than those for comparable siting options, considering locations of present and potential sources of waste, interim storage facilities, and other repositories." The second-repository program has not yet reached the point where potential sites can be identified--in contrast to the MRS facility, where an analysis is now possible because, since the publication of the draft EAs, potential MRS sites have been identified. As a result, the DOE cannot perform rigorous cost and risk analyses analogous to those done for the MRS case. However, certain assumptions about the potential impacts of a second repository can be based on previous studies. A discussion of the potential impacts of a second repository is found in Appendix A.

C.2.4.1.10 The use of existing casks in the EA analysis

Issue

A number of comments challenged the validity of using the characteristics of currently existing and NRC-certified casks for the transportation risk analysis in the draft EAs. The commenters recognized that the design of the new casks to be used for most shipments will reduce the number of shipments because of higher capacities. However, they questioned that the greater quantities of fuel in a single cask would provide a greater source for the release of radionuclides in a serious accident.

Response

The risk and cost assessments for transportation have been reevaluated, using the predicted characteristics of the new family of casks, even though their designs are not yet available. Risks were assessed for both normal and accident conditions, and assumptions that would result in the maximum expected impacts were used. Because of the conservatism in all assumptions, the impacts are similar to those calculated for existing casks, even though the new casks will require fewer miles of travel and fewer shipments. The results are found in Chapter 5 and in Appendix A.

C.2.4.1.11 Adequacy of current cask designs

Issue

Some commenters questioned the adequacy of the design of currently existing casks.

Response

The adequacy of cask design is a regulatory issue, and, since the existing spent-fuel casks have been certified by the Nuclear Regulatory Commission, the DOE has no reason to question the adequacy of their design. The existing casks have carried thousands of shipments without an accident that resulted in the release of radioactive material. The DOE will develop a new family of casks because it seeks to increase efficiency, not because it is concerned about the safety of existing casks. The new-generation casks will also have to meet regulatory requirements for cask design and be certified by the Nuclear Regulatory Commission. A more detailed discussion of the new family of casks is found in Appendix A.

C.2.4.1.12 Additional testing of casks

Issue

Several commenters expressed concern that casks are not sufficiently tested to ensure that the public is safe during transportation. Some suggested destructive testing of full-scale prototype casks.

Response

The Nuclear Regulatory Commission has specified a series of hypothetical accident conditions that a cask must be shown to survive. Survival can be demonstrated through analysis should the designer so choose or through testing, but destructive testing is not mandatory. However, many tests, including full-scale crash tests, have been conducted to verify analytical models. The results of analyses and experiments have been quite close, and hence considerable confidence has been developed in the analytical models used in design analysis.

Casks developed for the shipments to a repository will be certified by the Nuclear Regulatory Commission. The private contractors chosen to design and obtain certificates for the casks will be allowed to choose the manner of demonstrating how their designs comply with NRC regulations. At a minimum, the DOE will use an independent testing laboratory to perform destructive tests of scale models for cask designs as a benchmark or check of structural performance under accident conditions. In addition, nondestructive tests will be performed on each cask during and at the completion of manufacture, and the casks will be inspected before each shipment.

C.2.4.1.13 Cask weeping

Issue

Some commenters said that the phenomenon called "cask weeping" had not been considered in the risk assessments.

Response

The phenomenon of cask weeping can be described as follows: A cask that has been loaded or unloaded in a reactor storage pool becomes contaminated with radioactivity on its surface. Before shipment, the external surface of the cask is decontaminated to levels specified by regulations, but when the cask is inspected on arrival at its destination, contamination above the levels allowed by regulation is found. Though the actual mechanism is not understood, a possible explanation is that, when a cask is repeatedly placed into water-filled spent-fuel storage pools, it becomes contaminated over time, with the contamination penetrating deeper into the pores of the cask body. The cleaning removes the surface contamination, but the contamination that is deep in the pores remains. During the transportation of a loaded cask, the surface can become contaminated again as the deep contamination is driven out of the pores by the heat of the spent fuel inside the cask.

However, the levels of contamination associated with the weeping phenomenon are not high enough to be factored into the risk assessment for transportation, and procedures will be used to effectively preclude this problem during shipments to a repository. For example, wrapping the cask in plastic before entry into reactor fuel storage pools is an effective practice that is currently used. Therefore, weeping is not expected to be a significant contributor to risk during spent-fuel transportation to a repository and is not included in the transportation-risk assessment presented in Appendix A.

C.2.4.1.14 Adequacy of NRC testing requirements

Issue

Several commenters said that the tests that casks must pass to receive NRC certification are not severe enough.

Response

The conditions being challenged are established by the Nuclear Regulatory Commission, and the DOE will continue to rely on the Commission to verify the adequacy of the test conditions.

C.2.4.1.15 Legal impediments

Issue

Two commenters took exception to the DOE's interpretation of State or local restrictions against radioactive-waste transportation as "legal impediments" in favorable condition 7 of the technical guideline on transportation (10 CFR 960.5-2-7). In particular, the U.S. Department of Transportation (DOT) commented that, since its regulation of highway routing of radioactive materials (HM-164) has been established as valid by the U.S. Supreme Court, the only "legal impediment" would be a State or local routing rule that renders compliance with HM-164 impossible but is found not to be preempted under provision 112(b) of the Hazardous Materials Transportation Act (HMTA). If such a finding cannot be made, any State or local routing rule that prevents or seriously impedes compliance with HM-164 is preempted by the HMTA (Section 112(a)).

Response

Favorable condition 7 of the transportation guideline is the "absence of legal impediments with regard to compliance with Federal regulations for the transportation of waste in or through the affected State and adjoining States."

Insofar as the Department of Transportation is the responsible regulatory agency, the DOE defers to its interpretation of "legal impediment." Because State, local, or tribal laws or regulations restricting the transportation of radioactive waste that are inconsistent with either the HMTA or the DOT regulations issued thereunder are preempted by the HMTA, such laws or regulations are not considered legal impediments in the final EAs; a formal nonpreemption determination by the DOT, in response to a sepcific request, is required for such laws or regulations to become legal impediments. The findings in Chapter 6 reflect this change in interpretation and appropriate rationales for the finding are included in all EAs. A more extensive discussion of HM-164 is presented in Appendix A.

C.2.4.1.16 State designation of alternative routes

Issue

The commenters noted that in Appendix A the EAs contain an incorrect statement--namely, that State designation of alternative preferred routes must be approved by the Department of Transportation. They said that HM-164 does not require States to seek DOT approval of alternative designated routes.

Response

The Department of Transportation requires, under HM-164, that a "preferred route" be used for the transportation of controlled-quantity shipments of radioactive materials. Preferred routes are interstate highways and State-designated alternative routes. Although the States and Indian Tribes must comply with DOT guidelines (or an equivalent routing analysis that adequately considers the overall risk to the public) and consult with affected local jurisdictions, Indian Tribes, and potentially affected adjacent States before establishing a preferred route, there is no requirement to seek DOT approval of alternative designated routes. The EAs have been revised to reflect this in Appendix A.

C.2.4.1.17 Indian Rights

Issue

Several Indian Tribes commented that the EAs failed to recognize the authority granted to tribal governments on federally recognized Indian reservations under the HMTA and the rules set forth by the Department of Transportation in HM-164. One Indian Tribe noted that a ban on radioactive-waste transportation through its reservation constituted a "legal impediment."

Response

The final EAs use the DOT definition of "State routing agency." The DOT rules (HM-164) include appropriate Indian tribal authorities in the definition of "State routing agency" and, as such, allow the governments of Indian Tribes to exercise routing authority in a similar manner as provided for the State governments.

If a ban enacted by an Indian Tribe meets the criteria of the HMTA for nonpreemption, then (as in the case of any State ban) a legal impediment will be present. A more detailed discussion is given in Appendix A, (see also Section C.2.4.1.15).

C.2.4.1.18 Availability of railroads for transporting radioactive waste

Issue

One commenter noted that, though the DOE states that rail carriers are available for shipping radioactive waste, the willingness of the railroads to transport the waste is questionable.

Response

There have been a series of decisions by the Interstate Commerce Commission (ICC), affirmed on judicial review, on this and related issues over the past several years. The Commission has ruled that, as common carriers, the railroads cannot refuse to carry cask loads of spent fuel and to return empty rail casks. Furthermore, this transport must be accomplished in regular train service (as opposed to "special trains," which the Commission has found to be a "wasteful transportation practice"), unless the DOE chooses otherwise.

At this time uncertainty in rail transportation remains in the tariff rates. For eastern railroads, the Commission has upheld a DOE and industry challenge to the published tariff rates and has reduced and set the rate levels. However, for western and southern railroads, the question of rate appropriateness is pending before the Commission. Therefore, the issue does not appear to be whether the railroads will transport radioactive waste, but rather at what rates.

In order to more closely work with the railroads and to understand the concerns that do remain, the DOE has and will continue to invite them to participate in all stages of the transportation program, including the development and testing of shipping casks. Also, the DOE and the Association of American Railroads are planning joint activities to resolve issues.

C.2.4.1.19 Railroad regulations

Issue

A commenter asked for a description of the existing regulations for the transportation of radioactive waste by rail.

Response

Federal regulations regarding the transportation of hazardous material, including radioactive material, can be found in Title 49 of the Code of Federal Regulations, Parts 174.83-174.93. These regulations are concerned with the handling of placarded cars. In particular, for cars containing radioactive material, the regulations deal with the switching of cars, the ban on the use of passenger trains, and the position of cars in a train. A more-detailed discussion of rail regulations is included in Appendix A of the final EAs.

C.2.4.1.20 Dedicated trains

Issue

Several comments concerned the treatment of rail transportation in the EAs. In particular, the commenters objected that discussions and analyses of rail shipments were based on shipping in general commerce rather than by dedicated trains.

Response

Appendix A has been revised to include a general discussion of the use of dedicated trains and an analysis of the risks associated with using dedicated trains for the movement of waste from an MRS facility to a repository.

C.2.4.1.21 Regional transportation analysis

Issue

Federal agencies as well as several States and Indian Tribes criticized the regional transportation analysis, stating that it did not extend far enough from the site to include all of the pertinent impacts, such as weather hazards, the cost of building access routes, the radiological risk, traffic hazards and increased traffic volumes on highways connecting interstate highways with access roads, and possible routes across Indian lands.

Response

The "regional" transportation analysis includes, as a minimum, the routes from the potential site to the nearest interstate highway or mainline railroad; the analysis may be extended beyond that area if the circumstances at the particular location warrant it. However, the intent of the siting guidelines (10 CFR Part 960) is to focus on effects near the site. The estimates of the costs of building access routes will be improved during site characterization. Currently available data on road conditions (e.g., traffic volumes and potential hazards) are presented in the EAs. More-detailed data and a discussion of mitigation measures will appear in the environemental impact statement.

C.2.4.1.22 Weather impacts

Issue

Many commenters criticized the way in which weather impacts were considered in the transportation analysis. Some gave examples of weather-related road closings; others asked about the effect of weather on frequency and severity of accidents.

Response

Weather conditions are considered in favorable condition 9 of the transportation guideline: "A regional meteorological history indicating that significant transportation disruptions would not be routine seasonal occurrences" (emphasis added). This favorable condition is concerned with the absence of routine seasonal conditions that could disrupt repository activities to the extent that the annual waste-acceptance rate could not be met. Weather-related route closures are considered in the final EA, and the analysis of such closures is considered adequate for this stage of the site-selection process. When the number of sites has been narrowed and route-specific analyses are conducted, concerns about occasional weather-related bottlenecks between specific reactors and repository sites can be addressed.

C.2.4.1.23 Potential for human error

Issue

Some commenters stated that the potential for human error in the transportation of radioactive waste is not treated adequately in Appendix A.

Response

The DOE has considered the potential for human error in the assessment of transportation risks. A study prepared for the Nuclear Regulatory Commission (NRC, 1980) analyzed detailed incidents of human error and deviations from accepted quality-assurance (QA) practices in the transport of radioactive materials. The results indicate that the risks from human errors or deviations from accepted QA practices are extremely small (i.e., 0.000012 latent-cancer fatality per shipment-year for packages tested to accident conditions), and thus it is not meaningful to include these risks in the radiological risk analysis for transportation.

C.2.4.1.24 Retrieval of waste

Issue

Commenters asked about the impacts that would result from the transportation of waste retrieved from a repository should retrieval prove to be necessary.

Response

At this stage in the repository-design process, the full impacts of retrieval on transportation requirements are not known. If retrieval proves to be necessary, the spent fuel will be older and less radioactive than at the time of emplacement; it is therefore expected that the transportation of such waste should have less of an impact. A discussion of the retrievability issue in general can be found in Chapter 5.

C.2.4.1.25 Financing infrastructure improvement

Issue

Several commenters suggested that the costs of infrastructure improvements, such as the upgrading or reconstructing of roads or rail lines, should be considered in the cost analysis and that more information is needed on how such improvements would be integrated with local economic development plans.

Response

A preliminary analysis of the need for upgrading or reconstructing local roads and railroads was performed for the comparative evaluation of sites. Related discussions can be found in Chapter 6 of the individual EAs. The condition of local roads or railroads will be established during site characterization; it will be analyzed more rigorously for the environmental impact statement and again before the repository begins operation, and plans for integration into local development plans will be developed.

C.2.4.1.26 Adequacy of the transportation guideline

Issue

Many commenters expressed the opinion that the transportation guideline is not adequate for discriminating among sites. In particular, they stated that the use of legal impediments as a discriminator is inappropriate, as they may change over time; that transportation costs should not be considered in the ranking because they are of minor importance in comparison with transportation risks to the public and the environment; and that the guideline condition discussing weather impacts on transportation in the vicinity of the site should be expanded to include potential disruptions between the reactors and the site. Other commenters criticized the weight given to the transportation guideline, considering the potential impact of transportation.

Response

The siting guidelines (DOE, 1984c) were developed through consultation with affected and interested States, the Council on Environmental Quality, the Environmental Protection Agency, and the U.S. Geological Survey and received the concurrence of the Nuclear Regulatory Commission. The transportation guideline is one of three guidelines in the preclosure group on environmental, socioeconomics, and transportation. This group of guidelines is second in importance to the preclosure group on radiological safety but all the guidelines in any preclosure group are assigned equal importance.

C.2.4.1.27 Inadequate treatment of transportation issues

Issue

Many comments stated that a variety of general transportation issues received inadequate or no attention in either the body of the EA or in Appendix A. Among the issues listed were emergency response responsibilities, the impacts of using overweight trucks, rail routing requirements, inspection and enforcement, liability, safe havens, advance notification, training, sabotage, NRC safeguards regulations, and the responsibilities of the DOE as the shipper of record.

Response

Many of the topics listed by the commenters are discussed in the EAs, particularly in Appendix A. Since the draft EAs were published, additional policy decisions about several of the issues have been made, and, where additional information is available, the discussion of the issue has been expanded. It should be pointed out, however, that most of these issues, while of concern in the overall context of the transportation program, have little bearing on the site-selection process. They were included in the EAs primarily to give the reader a better understanding of the transportation program. For further information on how the DOE plans to interact with the States, Indian Tribes, and industry to resolve these other issues, the reader is referred to the Transportation Institutional Plan (DOE, 1985f).

C.2.4.2 Retrievability

Several commenters addressed the need and the desire to retrieve spent fuel and high-level waste after emplacement in the repository. The issues they raised include the view that wastes should not be placed where they cannot be retrieved, the DOE's plans for the length of the retrievability period, and the methods to be used in retrieval.

Issue

Some commenters said that at some point the United States may want to retrieve the spent fuel or high-level waste to reuse some of its components or to take advantage of new technical developments. The wastes should therefore not be emplaced where retrieval is not possible.

Response

In compliance with the Act and the NRC criteria for geologic repositories (10 CFR Part 60), the waste will be retrievable for up to 50 years after the emplacement of the first waste. The reason for retrieval would be to protect public health and safety. The DOE does not intend to recover the wastes for their economic value. The commitment to geologic disposal implicitly forfeits the future use of the waste in return for assurance that the waste has been permanently isolated from the human environment.

Issue

A commenter asked whether there is a scientific and political consensus about whether the wastes should be retrievable or permanently disposed.

Response

By mandating geologic disposal, the Act implies a political consensus that disposal must be permanent. The concept of permanent disposal is widely supported by the technical community and is explicit in the NRC and EPA regulations (10 CFR Part 60 and 40 CFR 191, respectively). The NRC requirement for retrievability is directed at demonstrating that the performance of the repository is adequate for permanent disposal.

Issue

Commenters asked that the DOE specify the period during which it plans to be able to retrieve waste.

Response

As required by the Nuclear Regulatory Commission in 10 CFR Part 60.111, the retrieval of waste from a repository will be possible at any time up to 50 years after the start of waste emplacement.

Issue

One commenter wanted to know how retrieval will be accomplished.

Response

If retrieval is necessary, it will be accomplished by reversing the steps taken for waste emplacement. The exact sequence and the equipment to be used for retrieval will depend on the design of the repository, the host rock of the repository, as well as the reason for retrieval (e.g., degree of container failure). Equipment for retrieval will be designed and tested before the license application, and the DOE's retrieval capability will have to be approved by the Nuclear Regulatory Commission.

C.2.4.3 Second repository

A number of comments concerned the location of the second repository and succeeding repositories and asked whether an indefinite expansion of the first repository is an alternative to constructing a second repository. Some parties wanted to know whether sites characterized for the first repository or sites not nominated for characterization for the first repository could be potential sites for the second repository. Others wanted to know why crystalline and argillaceous rocks were not considered for the first repository.

Issue

Commenters asked where the second repository will be located and whether both repositories could be located in the same State.

Response

With the exception of sites that were nominated but not recommended for characterization, the DOE may consider for the second repository any site previously considered for the first repository that was (1) not disqualified and (2) not selected for the first repository. The DOE is considering sites in crystalline-rock bodies in the eastern United States and announced 12 potentially acceptable crystalline sites as suitable for further consideration for the second repository (DOE, 1986).

The Act and the siting guidelines specify that the DOE must consider regionality in selecting the site for the second repository. It is therefore unlikely that the first and the second repository will be located in the same State.

Issue

A commenter wanted to know what will prevent an indefinite expansion of the first repository as an alternative to constructing a second repository.

Response

The Act allows the first repository to accept no more than 70,000 metric tons of uranium or the equivalent waste from reprocessing until a second repository is in operation.

Issue

Commenters asked for clarification on whether sites characterized for the first repository but not selected for the first repository can be considered for the second repository.

Response

The Act specifically states that sites that have been characterized for the first repository and are suitable but were not chosen for the first repository may be considered for the second repository. It is expected that all three sites characterized as part of the selection process for the first repository will be found suitable. The fact that only one of the three sites characterized is chosen for the first repository does not mean that the other sites are significantly less suitable.

Issue

The DOE should clarify whether potentially acceptable sites not nominated for characterization for the first repository can be nominated for characterization for the second repository.

Response

The Act permits the four sites designated as potentially acceptable sites but not nominated as suitable for site characterization to be considered as potential sites for the second repository. Whether they survive the selection process for the second repository will depend on the merits of those sites vis-a-vis other potential sites.

Sites that were nominated, but not recommended for site characterization, are not eligible to be considered for the second repository.

C.2.5 OTHER WASTE-MANAGEMENT ACTIVITIES

This section presents comments and responses on monitored retrievable storage, which the DOE plans to propose to Congress as an integral part of the waste-management system, the storage of spent fuel at the site of the reactors, and the reprocessing of spent fuel for the recovery of uranium and plutonium.

C.2.5.1 Monitored retrievable storage

A number of comments were concerned with retrievable storage, the DOE's plans for a facility for monitored retrievable storage (MRS), and the lack of information in the draft EAs about the role of an MRS facility in the overall waste-management system. Several commenters recommended that the DOE consider monitored retrievable storage as an alternative to permanent disposal. Some commenters requested information on the possible locations of the MRS facility.

Issue

The DOE should consider the retrievable storage of spent fuel in a facility where it can be monitored.

Response

The DOE has indeed considered of the need for, and the feasibility of, monitored retrievable storage, and was required to do so by the Act. The DOE considered alternative roles and schedules for MRS facilities and has assessed their value to the waste-management system. Specifically, the DOE evaluated a backup MRS facility to be constructed only if there is a significant delay in the repository program and an integral MRS facility that would receive and prepare spent fuel for disposal. Both options have been compared with the currently authorized system, which does not include an MRS facility. Early in 1986, the DOE expects to propose to Congress the construction of an MRS facility as an integral part of the total waste-management system.

Issue

Some parties said that the draft EAs lacked information about the role of an MRS facility in the waste-management system and suggested that the DOE discuss the possible locations for the MRS facility.

Response

The principal functions of an MRS facility would be to receive and prepare the waste for disposal, thus eliminating the waste-preparation functions from a repository, to serve as a hub for transportation operations, and to provide temporary storage.

After issuing the draft EAs, the DOE concluded that monitored retrievable storage should play an integral role in the waste-management system. Section 3.2 of Part I of Volume I of the Mission Plan (DOE, 1985a) describes this integral MRS concept and plans for its development.

On April 26, 1985, the DOE selected three candidate sites in Tennessee for an MRS facility (DOE, 1985g). The preferred site is the site of the canceled Clinch River breeder reactor; alternative sites are a site on the DOE's Oak Ridge Reservation and the site of the canceled Hartsville nuclear power plant.

The introduction to Chapter 5 of each EA has been augmented to discuss the role of the MRS facility, and the transportation analyses have been expanded to treat the effects of using an MRS facility.

C.2.5.2 Onsite storage

Some commenters asked about the potential for long-term or permanent storage at the power plants that generate the wastes as an alternative to transporting wastes over long distances. Other commenters suggested that the DOE should continue storage in existing spent-fuel pools.

Issue

Commenters said that the DOE should consider developing repositories near the reactors generating the waste instead of in one or more central repositories.

Response

Nearness to the reactors generating the waste is not an acceptable criterion for siting repositories. The principal criteria are those embodied in the siting guidelines: waste containment and isolation from the accessible environment after closure; preclosure radiological safety; suitable environmental, socioeconomic, and transportation conditions; and ease and cost of construction, operation, and closure. Even if sites meeting the siting guidelines could be found near the reactors, it would be imprudent and impractical to develop many repositories. In addition to requiring very large

expenditures, a multiple-repository program would require acceptance of many States and individual licenses for multiple facilities, long-term safety of each repository--a task that is formidable even for one repository. Two centralized repositories, as currently planned, would be able to accommodate all the waste and would solve the national problem of radioactive-waste disposal at reasonable cost.

Issue

The DOE should consider continuing storage in existing spent-fuel storage pools at reactor sites.

Response

In accordance with the Act, the DOE encourages the efficient use and expansion of at-reactor storage. At-reactor storage and the expansion of the on site capacity for that storage are the prime responsibility of the plant operators and owners, and not of the Federal Government. The Federal role is to encourage and expedite, where necessary, the expansion of that storage capacity until the spent fuel is shipped for emplacement in a repository for permanent disposal. However, the Act specifies geologic repositories as the means for permanent disposal and requires the DOE to site two repositories. Onsite storage is to be provided for a limited amount of fuel (1,900 metric tons of uranium) if any utility requests it and the Nuclear Regulatory commission determines that the utility is eligible. The DOE's program for such Federal interim storage is discussed in the Mission Plan (DOE 1985a, Vol. I, Part I, Chapter 3).

The storage of spent fuel in storage pools at reactor sites is safe for the purpose for which the pools were designed. Spent-fuel pools are meant to provide temporary storage, not an alternative to permanent disposal.

C.2.5.3 Reprocessing

Some commenters asked about the feasibility of reprocessing spent fuel, the use of stabilizing matrices for high-level waste, and the possibility of retrieving wastes from a repository for reprocessing. Other commenters wanted to know whether the wastes from the repository could be applied to any useful purpose.

Issue

Commenters questioned whether there are ways to recycle the components of the spent fuel or waste to be placed in the repository or in some way reverse the process of creating radioactive materials.

Response

There is no practical way known today of reversing the process that creates radioactive materials. The spent fuel could be reprocessed to remove the plutonium and uranium for use in other reactors. However, that does not substantially reduce the volume, heat generation, or radioactivity of the

material requiring disposal. Currently there are no plans for reprocessing spent fuel. The DOE is planning to accept spent fuel for disposal with no intent to retrieve it for reprocessing unless required to do so for the purposes of recovering economically valuable as required by the Act.

Both President Ford and President Carter imposed a ban on reprocessing commercial spent fuel in the United States in response to concerns that the recovered fissile could be diverted to foreign nations or terrorists and used in making nuclear bombs. President Reagan lifted the ban on commercial reprocessing on October 8, 1981, but it is current U.S. policy that the reprocessing of spent fuel from nuclear power plants must be a private-sector enterprise. Because of the lack of economic incentives, industry concern about licensing uncertainties, and the potential for changes in government policy, there is little industry interest in reprocessing.

Issue

Commenters feared that the spent fuel and high-level waste in the repository will be dug up for reprocessing and be reused.

Response

As already mentioned, the DOE plans to accept spent fuel for disposal with no intent to retrieve it for reprocessing unless required to do so for the purposes of recovering the economically valuable resources, as required by the Act. However, the Act requires the repository to be designed and constructed to permit the retrieval of any spent fuel emplaced in the repository during an appropriate period of operation of the facility. The reasons for such retrieval, may pertain to public health and safety, the environment, or the recovery of the economically valuable contents of the spent fuel. In addition, the Nuclear Regulatory Commission requires that the waste emplaced in the repository be retrievable for 50 years after the start of waste emplacement, and the satisfactory completion of a performance-confirmation program. The DOE will comply with these requirements.

Issue

Some comments recommended that glass or ceramic matrices be used to immobilize high-level waste.

Response

All of the high-level waste to be accepted by the repository--the defense high-level waste and the commercial high-level waste from the West Valley Demonstration Project--will be in the form of borosilicate glass.

Issue

Some commenters expressed concern that the materials in the repository will be used to make bombs.

Response

The nuclear materials for weapons are obtained from defense reactors specifically designed to produce such materials. The spent fuel from power reactors is much less useful in the manufacture of modern nuclear weapons, and the DOE has not intention of using it for this purpose.

C.2.6 TYPES OF WASTE TO BE RECEIVED AT A REPOSITORY

A number of commenters asked about the nature of the wastes to be received at the repository. Other comments concerned the effects of slower or faster rates of waste generation and the minimum age of the spent fuel to be emplaced in the repository.

Issue

Commenters wanted to know what kinds of waste are to be emplaced in the repository.

Response

The Nuclear Waste Policy Act, which authorizes the construction of the repository and prescribes procedures for its siting and financing, specifies that the repository is to accept high-level waste and spent fuel. Thus, the wastes that will be accepted by the repository will consist of spent fuel from commercial nuclear power plants, solidified high-level waste from the reprocessing of nuclear fuel from defense reactors, and a small amount of commercial high-level waste from a demonstration facility at West Valley, New York. Also emplaced in the repository will be the low-level waste that is generated at the repository during operations. If spent fuel is consolidated before emplacement in a repository, the repository may also accept some or all of the fuel-assembly hardware that will be left by the consolidation process. No other low-level waste, such as the waste from research centers, hospitals, and general industry, will be accepted. Although the Act does not forbid it, the DOE does not at present plan to accept foreign wastes for disposal in the repository. The acceptance of foreign wastes requires a report to Congress.

The volume of the waste will be such that two repositories are expected to meet the requirements for disposal well into the twenty-first century.

Issue

Commenters wanted to know how changes in the rates of waste generation would affect the operation of the repository.

Response

The duration of operations at the repository will be determined to a large extent by the rate of waste. The currently projected operational period of 28 years for the first repository will not be affected by changes in the rate of waste generation because much of the waste that will go into the first repository will exist by the time the repository starts accepting waste. The

length of operations at the second repository will be determined to a larger extent by its planned capacity and the rate of waste generation in the twenty-first century. The rate of receipt of wastes at the repository will have an impact on employment during the operations phase of the repository, but the impact will be relatively minor.

Issue

The EA analyses are based on 10-year-old spent fuel, but the DOE is committed to accept spent fuel as early as 5 years after it leaves the reactor.

Response

The DOE's contracts with the utilities obligate it to accept spent fuel that is 5 years old or older. The current DOE specification of generic requirements for repositories shows 5-year-old fuel as the baseline for design. The analyses reported in the EAs are based on an earlier assumption that only fuel that is 10 years old or older would be emplaced in the repository. The DOE has not yet performed an analysis for 5-year-old fuel. The final EAs have been revised to add a discussion that explains the DOE's plans to perform analyses for 5-year-old fuel in the repository and the possible impact of an MRS facility on the age of the spent fuel emplaced in the repository.

C.2.6.1 Defense waste

A number of commenters addressed the status and potential impacts of plans to accept defense high-level waste in the repositories.

Issue

Some persons wanted to know how the decision made to include defense high-level waste in the repository was made.

Response

In compliance with the Act, the Secretary of Energy reported to the President, in January 1985, the results of a study showing that there are no clear health and safety, transportation, public acceptance, regulatory, or national-security advantages or disadvantages associated with a separate repository for defense high-level waste and that there are clear cost advantages to emplacing defense and commercial wastes in the same repository. The President agreed with the Secretary's findings that a separate repository is not necessary for defense high-level waste. Therefore, in accordance with the Act, the Secretary of Energy is proceeding to arrange for the use of repositories developed under the Act for the disposal of defense waste. The evaluation report was released for general distribution in June 1985 (DOE, 1985h).

Issue

Many commenters felt that the subject of defense waste was not adequately covered in the draft EAs.

Response

The draft EAs did not contain much information about defense-waste disposal in the repositories, because the report on the subject (DOE, 1985h) was sent to the President in January 1985 (after the publication of the draft EAs), and the Presidential decision to include defense waste in the repository was made after that date.

It is important to note that defense high-level waste presents a lower radiological hazard per unit volume than does commercial high-level waste or spent fuel and a much lower heat-generation rate. The radiological risk analyses in the draft EAs, which are based on the assumption that only civilian waste will be accepted, therefore overestimate the risk of a repository containing both commercial and defense high-level wastes.

Some changes have been made to the EAs to reflect the decision to emplace defense waste. These include the addition of an entry in the tables on the incremental impacts of alternative repository designs. This new entry deals with the addition of defense waste. For consistency, these tables all appear at the beginning of Chapter 5 in the final EAs.

Issue

Several parties wanted to know who would pay for the costs of defense-waste disposal.

Response

The Act requires that, if defense waste is emplaced in any of the repositories developed under the Act, then a proper share of the costs of developing, constructing, and operating the repository is to be paid by the Federal Government into the Nuclear Waste Fund, which is used to finance the activities required by the Act.

Issue

Some persons asked whether the same safety standards will be applied to both defense and commercial high-level wastes.

Response

The January 1985 report to the President on the use of commercial repositories for the disposal of defense high-level waste (DOE, 1985h) stated that all defense waste to be disposed of will be in a form that satisfies the regulations governing the repository---namely, 10 CFR Part 60 (NRC, 1983), 10 CFR Part 960 (DOE, 1984c), and 40 CFR Part 191 (EPA, 1985).

Issue

Many commenters asked about the nature of defense high-level waste and the effect of its emplacement in the repository.

Response

Defense high-level waste results from the reprocessing of spent fuel. It differs significantly from commercial high-level waste and spent fuel because it has much lower concentrations of radioactive fission products and hence a much lower rate of heat generation. The 20,000 packages of defense high-level waste expected to be produced by the year 2020 are considered equivalent to 10,000 metric tons of uranium (MTU) of spent fuel. At the end of 1982, approximately 15 percent of the total radioactivity in spent fuel and high-level waste in the United States was from defense activities; most of the remaining 85 percent was from commercial spent fuel. By the year 2000, the amount of radioactivity in the defense waste is expected to drop to 3 percent of that of all wastes to be accepted by the repository.

In his report to the President (DOE, 1985h) on the potential uses of the repositories for defense high-level waste, the Secretary of Energy explained the DOE's interpretation of the capacity limit (70,000 MTU) imposed by the first repository until a second repository is in operation; the DOE's interpretation is that the limit applies to total quantity of waste--that is, both commercial and defense waste. The analysis in the report assumed that the firs repository would accept the 10,000 MTU equivalent of defense waste and 60,000 MTU of commercial waste and that the second repository would be in operation before the 70,000-MTU limit was reached. The report also said that, if all the defense-waste canisters expected to be produced by 2020 were emplaced in one repository with a capacity of 70,000 MTU, it would occupy only about 10 percent of the volume of repository. This fact is attributed to the low heat-generation rate of defense waste, which allows closer spacing between canisters than that for spent fuel. Thus, the inclusion of defense-waste canisters produced by 2020 will not necessitate any significant expansion of the repository. The Mission Plan (DOE, 1985a) includes a schedule for the acceptance of commercial and defense wastes in the first two repositories.

Issue

Commenters wanted to know about the origin of defense and commercial waste.

Response

Defense high-level waste results from reprocessing of spent fuel at DOE facilities. Commercial high-level waste and spent fuel come from nuclear power plants operated by electric utilities.

Issue

Commenters alleged that the DOE withheld the defense-waste report (DOE, 1985h) to make it appear that defense waste would be disposed of separately from commercial wastes.

Response

The DOE was required by the Act to submit a report to the President on the feasibility of combining defense and commercial waste in the repository. This report was released before the deadline (January 7, 1985), mandated by the Act. The DOE was not required to circulate the report for public comment before it was issued, but the report has been available to the public on request since its release was announced in the Federal Register (DOE, 1985i).

Issue

Some commenters were concerned that the repository might become a military operation because of the disposal of defense waste.

Response

The repository will not become a military operation. The defense wastes are produced at facilities operated by the Department of Energy, not the Department of Defense. Furthermore, there are no plans at present to use additional security measures because of the disposal of defense waste. Normal security measures taken to protect spent fuel during receipt and emplacement will be sufficient for protecting defense high-level waste. These security measures will not interfere with the liberties of citizens in the surrounding areas and will probably not involve military personnel in any capacity.

Issue

Some persons asked whether defense high-level wastes from Hanford will be disposed of in the repository.

Response

Defense wastes from Hanford, the Idaho National Engineering Laboratory, and the Savannah River Plant will be disposed of in the repository. Appendix A in the EAs has been changed to reflect that fact.

C.2.6.2 Foreign waste

Issue

Commenters asked whether foreign wastes will be emplaced in the repository.

Response

Although the Act does not specifically forbid the acceptance of foreign wastes at the repository, the DOE has no plans to do so.

C.2.6.3 Other wastes

Issue

Several persons wanted to know whether the repository will accept low-level radioactive waste from various sources or wastes, other than spent fuel, generated from the decommissioning of nuclear power plants.

Response

The Act authorizes the DOE to site and construct a repository for high-level radioactive waste and spent fuel. Wastes from the decommissioning of military or commercial nuclear reactors are not considered high-level waste at present, and therefore these wastes will not be accepted in the repository. Instead, these wastes are considered low-level wastes.

C.2.7 THE DRAFT ENVIRONMENTAL ASSESSMENTS

Many comments were concerned directly with the EAs. The issues they raised included the format, content, organization, consistency, and documentation of the draft EAs. In addition, many of the comments offered editorial suggestions; all of these were carefully considered in revising the EAs.

C.2.7.1 General comments on the environmental assessments and their function

Some commenters asked why the EAs were issued or why they preceded the DOE's Mission Plan and the EPA final standards. Others objected to their size and complexity, alleged inaccuracies, or incompleteness.

Issue

Some commenters questioned the place of the environmental impact statement (EIS) in the siting process, asking why environmental assessments were prepared rather than an EIS.

Response

The Act specifically requires an EA to accompany the nomination of a site as suitable for characterization (Section 112(b)(i)(E)). An environmental impact statement is one of the documents that will accompany the Secretary's recommendation to the President of one site for development as a repository.

Issue

Commenters pointed out that the Act requires the DOE to prepare a mission plan that would provide a base of information for the site evaluation and selection process. They questioned whether the draft EAs, and the preliminary site nomination and recommendations they contain, should have been prepared before the issuance of the mission plan.

Response

Section 301 of the Act requires the DOE to develop a mission plan that provides sufficient information for informed decisions in carrying out the repository program. A draft mission plan was issued in April 1984 (DOE, 1984a), 8 months before the draft EAs. The revised mission plan was issued in June 1985 (DOE, 1985a) and was used in revising the final EAs. The process and schedule established by the Act, however, did not allow the draft EAs to be delayed until the mission plan was published.

Issue

Several commenters stated that the EAs do not satisfy the requirement of the Act to identify unresolved technical issues and the problems that impede the implementation of the Act. In addition, they felt that the DOE's response to data gaps had been to say that issues would be settled in the final EAs.

Response

Although not required by the Act to do so, the EAs do identify the unresolved issues with regard to the siting guidelines; these issues are discussed in Chapter 6 of the EAs. The DOE believes that the findings made for the guidelines are based on sufficient data and information; the findings made at this stage of the site-selection process are to be based on available information. Definitive data will be collected during site characterization.

Some of the statutory requirements identified by the commenters pertain to the DOE's Mission Plan, not the EAs. Among them are requirements to identify unresolved issues and problems that may impede the implementation of the Act (see Sections 301(a)(2) and (3) of the Act). These requirements are addressed in Chapters 2 and 3, respectively, of Part II in Volume I of the Mission Plan (DOE, 1985a).

Issue

A commenter suggested that the DOE issue another set of draft EAs. The commenter expressed concern that the EAs would be so extensively rewritten in response to public comments that the public should be allowed to review the revised EAs in draft before they are issued in final form.

Response

The DOE will not reissue the EAs in draft for comment for the following reasons. First, most of the changes in the final EAs were made in response to public comments and are explained in this comment-response appendix. Second, the final EA is a final agency action and is therefore subject to judicial review. Third, the DOE believes that it has been responsive to comments on the draft EAs and that an additional comment period would not result in further significant improvements. Finally, interested parties will have additional opportunities to comment on the site-selection process through hearings and comments on the site-characterization plans, the environmental impact statement, and other program documents.

Issue

A number of comments implied that the DOE treated the EA process in a perfunctory manner. Some commenters felt that the DOE did not produce EAs that met the intent of the Act; some even stated that the documents were worthless.

Response

The Act requires the following six major assessments to be included in the EAs:

1. An evaluation by the Secretary as to whether the site is suitable for site characterization under the guidelines.

2. An evaluation by the Secretary as to whether the site is suitable for development as a repository under each such guideline that does not require site characterization as a prerequisite for the application of such guideline.

3. An evaluation by the Secretary of the effects of site-characterization activities at the site on public health and safety and the environment.

4. A reasonable comparative evaluation by the Secretary of the site with the other potentially acceptable sites.

5. A description of the decision process by which the site was recommended.

6. An assessment of the regional and local impacts of locating the repository at the site.

The EAs contain all of these evaluations or descriptions.

The DOE went beyond the requirements of the Act in issuing draft EAs and revising the documents in response to the comments, which required substantive changes. The EAs provide a workable data base for site nomination and recommendation for characterization.

Issue

Commenters said that the draft EAs, and the preliminary site nominations and recommendations they contain, should not have been prepared before the issuance of the final NRC and EPA standards for geologic disposal.

Response

The Act requires the Environmental Protection Agency to establish standards for protecting the public from the radioactive material in geologic repositories. These standards are to be implemented and enforced by the Nuclear Regulatory Commission. The EPA standards are contained in 40 CFR Part 191. The NRC technical criteria for implementing the EPA standards are contained in 10 CFR Part 60. Both sets of regulations were issued in draft

form in 1982 and were used in developing the siting guidelines. The final NRC criteria were released in June 1983, before the draft EAs; the final EPA standards were released in September 1985, after the draft EAs. The schedule requirements of the Act did not allow the draft EAs to be delayed until September 1985; but the final EPA standards were used in revising the EAs.

Issue

Many commenters felt that the size and technical complexity of the EAs discourage review by the public.

Response

The EAs are indeed long documents that contain many technical discussions. Their length is the result of an attempt to present as much information as was deemed necessary for compliance with Appendix IV of the siting guidelines (DOE, 1984c), which specifies what kinds of information should be used to support findings about compliance with the guidelines, and as much information as was needed for the evaluations required by the Act. For the same reasons, much of the material presented in the EAs, especially in Chapter 6, is of necessity technical because it presents evaluations of sites against the various conditions specified in the guidelines--conditions that are usually specified in technical terms. Every effort was nonetheless made to make the technical presentations clear and comprehensible.

Issue

Some parties criticized the organization of the EAs, saying that it was confusing to find certain topics discussed in more than one chapter.

Response

The organization of the EAs was based on (1) the requirements of the Act, which specifies, in Section 112(b)(E), the evaluations, descriptions, and analyses that are to be included; (2) the requirements of the siting guidelines, which specify the order of certain evaluations (e.g., the identification of the preferred site in a geohydrologic setting); and (3) the general format and content usually followed in preparing environmental assessments.

Thus, Chapter 2 includes an evaluation of the site against the disqualifying conditions of the guidelines as required by the guidelines; for completeness, this evaluation is repeated in Chapter 6, which presents the Act-mandated evaluation against the guidelines. Chapter 7, which is also required by the Act, of necessity repeats some material contained in Chapter 6, though in a greatly abbreviated form. The repetition is unavoidable because Chapter 7 is essentially a summary compilation and comparison of the data presented in Chapter 6 for every site. A few commenters felt that the EAs should include more information in Chapter 5 about the financial effects of site characterization and repository development on local communities and the grant programs applicable to individual sites.

Issue

One commenter asserted that the analyses performed by a former DOE contractor that was fired for unsatisfactory performance were nonetheless used to substantiate the draft EAs.

Response

The commenter is incorrect in asserting that the work of a "fired" DOE contractor was used to substantiate the draft EAs. The DOE contractor in question was a general program-management contractor that prepared area-characterization studies. This contract expired and was opened for bids according to Federal procurement regulations. The contractor was not selected for further work, but was not dismissed for unsatisfactory performance as the commenter alleges. The DOE considers the analysis performed by this contractor to be valid and useful.

Issue

Some commenters suggested that technical review groups should be assembled to verify the data, procedures, assumptions, and conclusions in the draft EAs.

Response

Technical review groups were used to review the EAs at several levels. Such groups were used by the DOE Project Offices that prepared the EAs, by the Office of Civilian Radioactive Waste Management and its contractors, and by the Office of Environmental Compliance of the DOE's Assistant Secretary for Environment, Safety and Health.

Issue

Some commenters objected that, although a significant percentage of the residents in the area of Swisher and Deaf Smith Counties, Texas, are Spanish-speaking, the reports were released only in English.

Response

To translate documents as long and complex as the EAs would require an expenditure of time and resources that could not be justified. However, the DOE is preparing a variety of public-information materials in Spanish in response to requests to provide information to the Spanish-speaking residents of Texas. The DOE expects that, by being prepared especially for the general Spanish-speaking public, these materials will prove to be a more practical means of access to information about the program than the EAs.

Issue

Some parties suggested that the DOE publish an abbreviated version of the EAs.

Response

Like the final EAs, the draft EAs contained an executive summary that briefly described the site, the process by which it was selected, and its evaluation against the guidelines. These executive summaries were also distributed separately as overviews. Overviews are also available for the final EAs.

Issue

Commenters complained that the DOE issues inaccurate reports, expecting the States and the general public to find the inaccuracies without paying for these services. Others said that the EAs are propaganda for the program and do not present scientific findings.

Response

The DOE tried hard to ensure that the draft EAs were correct, including several reviews by the DOE, its contractors, and peer review groups. However, in documents of the size and the scope of the EAs, some errors are bound to occur.

The objective of issuing the draft EAs, which was not required by the Act, was to increase the participation of the public in the siting process and to apprise the public of the bases for decisions in the siting process. Though the DOE is pleased to acknowledge the many helpful contributions made by the commenters, in no sense did the DOE view the publication of draft EAs as a means of obtaining free services from the general public.

Issue

Some commenters expressed the view that the technical inaccuracies in the EAs caused the public to lose confidence in the entire process.

Response

The draft EAs represent the best available information. In accordance with the Act, they were prepared before site characterization and hence before many site-specific data were available. During site characterization and the concurrent environmental and socioeconomic studies, the DOE will collect the detailed information required to demonstrate compliance with the guidelines and with NRC and EPA regulations. Even with thorough and repeated critical reviews by different parties, some technical inaccuracies are unavoidable in documents as large and complex as the draft EAs, especially since some of the analyses were based on information from the literature rather than studies performed at the site. As already mentioned, every effort was made to correct the inaccuracies in the final EAs.

Issue

Some commenters objected to the use of averages instead of worst-case scenarios in the EAs.

Response

The use of averages is appropriate, especially for this stage in the site-selection process. For nomination and recommendation of sites for characterization, the siting guidelines (10 CFR Part 960) require only that the evidence available does not support findings that the sites are unsuitable. At any stage, worst-case analyses that are not accompanied by information on the probabilities of those cases are inappropriate. The EPA has recognized the latter fact in its environmental standards for the disposal of spent fuel and other wastes. In those standards, specific probabilities of compliance--representative of less than worst-case scenarios--are required.

C.2.7.2 Supporting references

A number of comments were directed at the references that support the analyses and results presented in the EAs. Among these were comments objecting that these references were not available to the public or that the quality of the references was poor.

Issue

Some persons stated that the public was not able to participate fully in the evaluation of the EAs because it was not provided with the data base that supports the decisions.

Response

The reference documents for the draft EAs are available in the public reading rooms of DOE Headquarters and Project Offices (see Appendix B) and were mailed to each affected State and Indian Tribe for review.

Issue

Commenters said that some of the references that supported the draft EAs were either completely unavailable or were not released until half-way through the 90-day comment period. This delayed release did not allow the States and interested parties adequate time for review.

Response

The DOE made every effort to make references available for public review by collecting them in DOE public reading rooms. Some of the references were in draft form at the time the draft EAs were published and were not available for public review until later in the comment period. These were added to the collection as they became available. All references cited in the final EAs are available for review at the locations listed in Appendix B.

Issue

Some commenters contended that the quality of the references was poor; some analyses relied on personal communications for support, rather than published documents.

Response

In the absence of published data, it was occasionally necessary to rely on documents in preparation or on personal communications from the investigators performing the analyses for the EA. Personal communications, DOE memoranda, and DOE correspondence were also used to document the site-selection process, and communications obtained in interviews with representatives of local governments were used as sources of information about local conditions (e.g., availability of community services) for which no published data are available. These informal references could have been cited parenthetically in the text or presented in footnotes. The DOE decided, however, to treat them as formal references and to make them available to the public together with the formal references to published documents. The locations where these references are available for review are given in Appendix B.

Issue

Commenters requested that a list of references for Chapter 7 be included in the EAs.

Response

Since Chapter 7 is based on the information given in Chapter 6 and does not rely on additional sources of data, no references are included. Otherwise it would have been necessary to combine five long lists of references (those presented in Chapter 6 of the EAs for the nominated sites). The reader interested in the supporting data for the findings on which Chapter 7 is based should refer to the section of Chapter 6 that covers the particular guideline of interest.

Issue

A commenter requested that the final EAs list the locations where copies of the references cited in the EAs can be examined.

Response

At the public briefings held in each affected state, the DOE distributed booklets listing the locations where copies of draft-EA references were available. In response to the above request, a list of all locations where copies of references can be examined is given in Appendix B of the final EAs.

Issue

Some commenters pointed out that additional reference material was submitted for DOE review and requested that specific reports and lists be used in the final EAs.

Response

The DOE recognizes and appreciates the efforts expended in sending materials for review. The documents were directed to the appropriate EA authors to be considered in revising the EAs.

During the Utah hearings, several persons read pages from the log book for visitors to the Canyonlands National Park. The comments of the tourists were entered into the official EA comments and were considered in reanalyzing for the final EA the potential effects of a repository on tourism.

References that were not within the scope of the Civilian Radioactive Waste Management Program were forwarded to the appropriate persons in other DOE programs.

C.2.7.3 Content of the environmental assessments

Issue

Among the comments was the objection that the draft EAs did not list the rankings of all nine sites studied.

Response

As discussed in Chapter 1 of the environmental assessments, the siting guidelines specify the following steps for ranking the potentially acceptable sites:

1. Evaluate the potentially acceptable sites in terms of the disqualifying conditions specified in the guidelines.

2. Group all potentially acceptable sites according to their geohydrologic settings.

3. For those geohydrologic settings that contain more than one potentially acceptable site, select the preferred site on the basis of a comparative evaluation of all potentially acceptable sites in that setting.

4. Evaluate each preferred site within a geohydrologic setting and decide whether such site is suitable for the development of a repository under the qualifying condition of each applicable guideline.

5. Evaluate each preferred site within a geohydrologic setting and decide whether such site is suitable for site characterization under the qualifying condition of each applicable guideline.

6. Perform a reasonable comparative evaluation under each guideline of the sites proposed for nomination.

Because one site is selected in each geohydrologic setting that contains more than one site, it is not consistent with the siting guidelines to rank all nine potentially acceptable sites.

Issue

Some persons felt that the EAs did not adequately consider the religious attitudes of Indians about land.

Response

The DOE recognizes the need to identify and respect Indian values and is in the process of developing a programmatic memorandum of agreement with the Advisory Council on Historic Preservation. The agreement will ensure the consideration of Indian religious freedom under the American Indian Religious Freedom Act. In revising the EAs, Indian cultural values have been considered. The EA for the Hanford site notes that the Yakima Indian Nation has extensive historical and spiritual ties to the land on which the site is located.

Issue

Several commenters said that the draft EAs did not consider the impacts of site characterization on Indian Tribes, ceded lands, and treaty rights to off-reservation fishing.

Response

As explained in Chapter 4 of the EA for the Hanford site, the DOE believes that Indian Tribes will not be significantly affected by site characterization.

Issue

Commenters stated that discussion of the siting process for the first repository was deficient in the draft EA. Because siting decisions were made before the Act was passed and before the publication of the guidelines, the DOE should discuss the basis for these decisions in the draft EA.

Response

The siting decisions made before the publication of the guidelines were based on criteria similar to the guidelines. The bases for these decisions are discussed in detail in the documents cited in Chapter 1 of the EAs. A more detailed discussion of the process in Chapter 1 is therefore unnecessary.

Issue

Specific suggestions for improving the EAs included the addition of a glossary and a key-word index.

Response

A glossary was included in the draft EAs, as it is in the final EAs. However, because of the limited time available to prepare and revise these documents, it was not possible to add a key-word index.

Issue

A number of commenters suggested specific revisions to Chapter 1 of the draft EAs. Some of those suggestions were editorial; some were specific suggestions applicable to only one site. The suggested general changes can be summarized as follows:

1. Chapter 1 should describe how the DOE would substitute sites for those eliminated by characterization.

2. Chapter 1 should point out that the Act requires the DOE to issue the site-characterization plans for review by the States and the public as well as the NRC.

3. Chapter 1 should be revised to indicate that site characterization begins only after the completion and review of site-characterization plans and public hearings.

4. Chapter 1 should mention the right of an affected Indian Tribe to issue a notice of disapproval.

Response

In response to the first three comments, Chapter 1 was revised as appropriate.

In regard to comment 4, the Act allows an affected Indian Tribe to issue a notice of disapproval if a proposed site is located on its reservation (Section 118(a)). However, none of the potentially acceptable sites is located on any Indian reservation, and although the DOE welcomes their participation in the repository program as affected Indian Tribes, the Indian Tribes do not have the statutory authority to issue a notice of disapproval.

Issue

One commenter said that the EAs should include a detailed explanation of how the entire process is funded.

Response

The DOE's program for the management of civilian radioactive waste is funded from the Nuclear Waste Fund, which was established by Congress and consists of monies paid into the fund by the utilities that generate the radioactive waste. A more detailed explanation of the funding is given in the Mission Plan (DOE, 1985a).

Issue

One commenter felt that the EAs should include more information in Chapter 5 about the financial effects of site characterization and repository development on local communities and the grant programs applicable to individual sites.

Response

The socioeconomic impacts expected during site characterization are discussed in Section 4.2 of the EAs, which also explains what financial assistance would be available to the affected community.

The impacts expected during repository development are examined in Section 5.4.5 of the EAs; this section includes a discussion of the financial assistance that will be available. Information on financial assistance can also be found in the DOE's Mission Plan (DOE, 1985a, Vol. I, Part I, Chapter 4). (See also Sections C.2.1.2 and C.2.1.5.1 for comments and responses on the mitigation of fiscal and socioeconomic impacts.)

Issue

Some commenters said that more-detailed schedules are needed in the final EA.

Response

The EAs do not contain detailed schedules because the latter are given in the Mission Plan (DOE, 1985a) and the draft Project Decision Schedule (DOE, 1985b). The schedules of activities for site characterization will be presented in greater detail in the site-characterization plans. Plans and schedules for the environmental, socioeconomic, and transportation studies to be conducted concurrently with site characterization are also being prepared.

Issue

A commenter felt that the discussion of qualifying conditions in the EAs is given more prominence than the discussion of the disqualifying conditions.

Response

Disqualifying conditions describe conditions that are considered so adverse as to constitute sufficient evidence to conclude without further consideration that a site is disqualified; they were formulated to provide early evidence of the suitability of a site and hence require fewer data and less-complex analyses than do the qualifying conditions. They are discussed in both Chapter 2 and Chapter 6 of the EAs.

Issue

Some commenters asked that more information be included in the EAs about the program for public education and participation.

Response

The program for public information and participation is explained in detail in the DOE's Mission Plan (DOE, 1985a, Vol. I, Part I, Chapter 4). (See also Section C.2.1 for comments and responses on this topic.)

Issue

Commenters requested that the discussion of the guidelines in the EAs be clarified.

Response

The format, structure, purpose, and application of the guidelines in the EAs are discussed in Section 6.1. Additional information can be obtained from the "Supplementary Information" on the guidelines themselves (DOE, 1984c) or from the DOE's responses to comments on the proposed guidelines (DOE, 1983).

Issue

Commenters suggested that an appendix listing all EA authors and their qualifications should be added to the EAs.

Response

A list of contributors is not included in the EAs because a fair and comprehensive list would consist of hundreds of names. To prepare such a list of persons who contributed to the EAs would be a task requiring a great deal of time. The commenter can be assured, however, that the contributors to the EAs are qualified and experienced professionals, and many of them have earned distinction in their scientific discipline.

C.2.7.4 Inconsistencies in the environmental assessments

Inconsistencies in the EAs were the subject of many comments, which noted inconsistencies in the assumptions about the age of the spent fuel, the waste package, the exploratory shafts and the shafts for the repository, the descriptions of surface facilities, assumptions used in radiological assessments, the models and assumptions used in analyses of socioeconomic impacts, analyses of worker health and safety, and several other topics.

Issue

A number of commenters pointed out inconsistencies between the executive summaries and the corresponding chapters in the draft EAs.

Response

There were indeed some inconsistencies, resulting mainly from a failure to update the executive summaries after the last revision (one of several) of the draft EAs. In revising the final EAs, the executive summaries were corrected to reflect the corresponding chapters.

Issue

Some commenters pointed out that the draft EAs were inconsistent in their presentation of air-quality impacts. For example, the EA for the Deaf Smith site considers vehicle emissions and fugitive dust in evaluating the impacts

of repository operation, whereas the EA for Davis Canyon does not do so. The draft EAs were also said to be inconsistent in their treatment of regulations for the Prevention of Significant Deterioration (PSD).

Response

The air-quality evaluations for each site have been revised as a result of comments from the States, the public, and other Federal agencies; the results are presented in a format that is as consistent as possible. Some differences remain, however, because the evaluations must use available data, which can vary among the different sites, and because the air-quality regulations are implemented by different agencies for each site. The revised impact analyses have reconsidered air-quality models, inputs (e.g., vehicle emissions, fugitive dust), operating assumptions, and PSD applicability according to guidance from the appropriate regulatory agencies.

Issue

Many commenters said that the EAs need to provide a fuller and more realistic discussion of socioeconomic impacts and to expand the discussion of mitigation measures. They also need to address the positive socioeconomic impacts of a repository.

Response

Chapter 5 of the EAs addresses general provisions for financial and technical assistance to mitigate adverse socioeconomic impacts. Site-specific mitigation measures will be developed after the DOE has performed a detailed impact analysis and the affected State or Indian Tribe has submitted an impact report for the site recommended for repository development. (See also Sections C.2.1.2.4 and C.2.1.5 for comments and responses on this topic.)

The EAs also address some of the positive socioeconomic impacts of a repository, such as the potential for new local jobs, total project and local purchases, and likely sources of additional tax revenues. The final EA for the Hanford site also discusses the potential for greater use of the area's available human and physical resources.

Issue

Some commenters criticized the EAs for using different approaches and bases for the socioeconomics analyses--in particular, different labor-force estimates, different multipliers for the indirect employment expected to result from the repository, and different assumptions about the in-migration of repository workers. One comment objected that no adequate explanation was given in the EAs for the differences in the employment and in-migration estimates and stated that the population increase estimated in the EA for the Yucca Mountain site appears to be due to an "overly conservative analysis."

Response

It is true that the EA analyses for the different host rocks used different labor-force estimates, employment multipliers, and assumptions about in-migration. However, some of the differences to which the commenters object

are unavoidable because of differences in the design of the repository, the availability of data, and local conditions, which vary significantly among sites. Furthermore, the socioeconomic analyses were performed by several different groups of analysts, who used assumptions and multipliers they deemed most suitable for the socioeconomic conditions of the site and the available data.

The population increase estimated for the Yucca Mountain site did indeed differ greatly from that for the other sites, but a significant part of this difference was attributable to the larger work force required for a repository at Yucca Mountain. The work force estimated in the draft EA for Yucca Mountain was as much as three times the work force estimated for the other sites. In the final EA for Yucca Mountain, the work-force estimate is lower, and so is the population increase projected for southern Nevada. The employment multiplier, while higher than that for the other sites, is the most reasonable multiplier for southern Nevada and is based on published analyses of historical data on employment in southern Nevada. The assumption that all of the repository workers would in-migrate was recognized and identified as being conservative in Chapter 5 of the draft EA for Yucca Mountain. It was chosen because detailed information about labor skills was not available and because it allowed the DOE to estimate the worst-case impacts on community services.

For the Hanford site, the socioeconomic analysis presented two scenarios. A maximum population estimate was based on an assumption of 100 percent in-migration, and a more likely estimate assumed that 75 percent of the miners and 25 percent of all other workers would in-migrate. The employment multiplier used was only slightly lower than that for Yucca Mountain. Again, the 100 percent maximum estimate was used to present a conservative analysis that would demonstrate that even worst-case impacts would be insignificant in this area, which has an excess of housing and public services.

For the salt sites, the lack of local socioeconomic data for a project as large as a repository led to an approach based on data for the study area and the use of multipliers from the literature (energy developments in the western States and projects of the Tennessee Valley Authority). This approach produced a high and a low range of estimates for in-migration and the associated impacts. The case of high in-migration was selected as a realistic, though conservative, case and was used for the impact analysis. Unlike the Hanford and Yucca Mountain sites, an assumption of 100 percent in-migration for the salt sites would have been inappropriate considering the socioeconomic conditions of the study area. It would have produced unrealistic overestimates of population increases in the smaller communities near the sites.

Issue

One commenter noted that the draft EAs are inconsistent in their treatment of worker health and safety. In particular, the following inconsistencies were pointed out:

1. The EAs for Yucca Mountain and Hanford present estimates of expected worker injuries and fatalities during site characterization, while the EAs for Davis Canyon, Deaf Smith, and Richton present estimates of only injury and fatality rates.

2. The Yucca Mountain analysis uses 1982 statistics provided by the National Safety Council. The Hanford analysis is based on a 1980 DOE report, while the Davis Canyon, Deaf Smith, and Richton analyses used 1976-1979 statistics from the Mine Safety and Health Administration (MSHA).

3. The EA for the Hanford site discusses occupational safety and health in Chapter 5, including specific numbers of expected injuries and fatalities during mining and construction. The EAs for Davis Canyon, Deaf Smith, and Richton give only rates. The EA for Yucca Mountain has no such analyses in Chapter 5.

4. The EAs for Hanford and Yucca Mountain discuss occupational safety in Section 6.3.3.2. The other three EAs do not.

5. The EAs for Hanford, Davis Canyon, Deaf Smith, and Richton discuss the applicability of various Federal and State occupational safety and health regulations. The EA for Yucca Mountain does not.

Response

The draft EAs for Hanford, Yucca Mountain, and the salt sites used different sources for their safety analyses. Hanford cites DOE Order 5480.1A, Yucca Mountain cites the National Safety Council (NSC), while the salt-site analyses are based on injury experience reports from the MSHA. Nonetheless, the estimates of fatalities, accident rates, etc., are not inconsistent. There is a direct correlation between the various sources.

From 1930 through 1977, MSHA statistical measures for injuries in mining used a basis that was somewhat different from that for the other industries. However, beginning with calendar year 1978, the MSHA adopted measures for injury experience that compare closely with the measures used in the Office of Occupational Safety and Health Statistics, the Bureau of Labor Statistics, and the U.S. Department of Labor. Therefore, beginning with 1978 data, the mining industry can be compared on a standard basis with other U.S. industries.

The MSHA requires all mine owners to report all accidents to the district office on a prescribed form. Because of the modification in reporting and processing procedures that became effective January 1, 1978, injury rates as currently computed are not precisely comparable to those of the previous years. Fatality rates, however, in which the "incidence rate" (the term used after 1977) is one-fifth of the "frequency rate" (the term used before 1978) for otherwise similar grouping, remain comparable.

The statistical data in the MSHA reports cover the work experience of all personnel engaged in exploration, development, production, maintenance, repair, and construction work, including supervisory and technical personnel, and onsite office workers. These activities cover the entire spectrum of the exploratory-shaft activities and, as such, are a better tool for statistical

projections of probable exploratory-shaft injuries. As compared with the reported accidents in the MSHA report, the National Safety Council uses sampling techniques for projections of probable injury experience.

The NSC statistics show that in 1982 there were 600 fatalities for 1.1 million workers in the mineral-extraction industry (including quarries). This figure reduces to 0.05 per 200,000 man-hours and compares with 0.06, 0.04, and 0.3 in MSHA's reports for the years 1976, 1977, and 1978, respectively. Similarly, the NSC statistics show 3.1 nonfatal injuries with days lost, which compares with 3.87, 3.78, and 5.48 such injuries reported by the MSHA for the 3 years. The NSC projected 4.7 total injuries per 200,000 man-hours for 1982, which compares with 5.96, 5.73, and 8.81 total injuries for the 1976-1978 period.

The final EA for Yucca Mountain includes a discussion in Chapter 5 of occupational health and safety.

Issue

Some commenters stated that the analyses for all sites should be based on the assumption of 10-year-old spent fuel because this assumption is likely to be conservative and will provide a common basis for comparison.

Response

All analyses in Sections 6.4.1 and 6.4.2 of the final EAs are based on the emplacement of spent fuel that is 10 years old.

Issue

One commenter recommended that the assessments of preclosure radiological safety under normal conditions should be based on similar assumptions about failed fuel rods.

Response

The analyses presented in the final EAs are based on the conservative assumption that 0.5 percent of the fuel rods arriving at the site have failed.

Issue

Several parties commented that, in estimating waste-package failure, all EAs should assume that failure occurs when some portion of the container wall corrodes, not necessarily the entire thickness.

Response

The approach suggested by the commenters is used in the Hanford EA and in the EAs for all of the salt sites. The approach of the Yucca Mountain EA was to use a simple estimate that is based on expected conditions, taking into account that few data have yet been obtained for repository conditions at Yucca Mountain. Thus, although the estimates indicate a lifetime of 30,000 years, the value actually used is 3,000 years to provide a very conservative lower bound for container lifetime.

Issue

Some commenters complained that comparisons among the sites are difficult because the EA analyses are based on different container designs.

Response

The design of the container depends on the characteristics of the site. For example, one of the criteria for design is usually the peak rock temperature, which depends on both the thermal properties of the rock and the amount of heat generated by the waste in the container. Therefore, container sizes and designs are different for different rock types, and the assumption of a common canister size or design in the EAs would not facilitate valid comparisons among the sites. For this reason, the EAs were not changed to reflect a common canister size or design.

Issue

One commenter stated that variations in container-design criteria need to be explained or justified in the EAs.

Response

Each of the repository projects is developing waste-package designs to meet the NRC's requirement for a container lifetime of 300 to 1,000 years and a radionuclide-release rate of less than 10^{-5} per year.

Issue

Several commenters asserted that the analysis and findings in the draft EAs did not reflect sufficient conservatism, considering the lack of site-specific data on which to base site nomination and recommendation decisions.

Response

Where no site-specific data were available, the EAs used extrapolations of regional data or conservative assumptions, in accordance with the DOE siting guidelines. A conservative approach was taken in evaluating the site characteristics that are important to the performance of the repository.

Issue

One commenter noted that the draft EAs differ in the number and the size of shafts drilled for site characterization and repository operations and said that the DOE should explain the technical basis for these variations.

Response

The draft EAs for the Yucca Mountain and the salt sites presented analyses based on the sinking of only one exploratory shaft. At the time the draft EAs were published, the DOE had already decided to sink two shafts at each site, but there was no time to revise the analyses in the draft EAs. The

construction of a second shaft would not significantly increase the impacts of site characterization. The final EAs have been revised to account for two shafts at all sites.

The number of shafts required for the repository depends on the host rock; thus the numbers of shafts is different for a repository in basalt, salt, or tuff.

Issue

One commenter stated that the surface-facility descriptions for all of the EAs should be the same, or the variations should be explained.

Response

The surface facilities of a repository depend partly on site-specific conditions, such as the terrain, and partly on the host rock; the host rock determines the number and size of shafts, the layout of the underground repository, the ventilation requirements, and similar factors that affect the design and layout of some surface facilities. Thus the surface facilities vary for repositories in basalt, salt, and tuff.

C.2.8 MISCELLANEOUS

Many of the comments in the draft EAs covered various topics, many of which were not concerned with the nomination of sites or even repository siting in general. These comments have been divided into three categories: production of radioactive waste, alternatives to geologic disposal, and general technical issues.

C.2.8.1 Production of radioactive waste

Several commenters maintained that the production of nuclear energy should never have been begun without establishing a method for radioactive-waste disposal. Many commenters recommended that the production of nuclear energy and thereby the production of radioactive waste be stopped until a solution is found for the permanent disposal of radioactive waste.

Issue

Commenters expressed the opinion that the production of nuclear energy should not have been begun before the development of a method for the permanent disposal of the radioactive waste.

Response

The search for suitable methods of permanent disposal began early in the development of nuclear energy. By 1957, for example, the National Academy of Sciences had already recommended geologic disposal in salt formations. Furthermore, in the early days of nuclear-energy development, it was generally

assumed that spent fuel would be reprocessed after being discharged from the reactor. The spent-fuel rods were stored in water pools at the sites of the reactors pending the start of reprocessing, and until the U.S. moratorium on reprocessing was declared in 1976 (see Section C.2.5.3), there was little incentive to develop disposal methods for spent fuel.

Issue

Commenters requested a moratorium on the production of commercial radioactive wastes.

Response

The production of electricity by nuclear energy is important to the national economy. In 1984, nuclear energy provided about 14 percent of the U.S. domestic electricity (DOE, 1985i). Nuclear energy is able to provide economical electric power, independent of foreign energy sources, while allowing the conservation of fossil-fuel reserves for other critical applications; it can help meet the future energy needs of this country. A moratorium on nuclear-energy production would severely damage U.S. energy and economic security.

Furthermore, a moratorium on radioactive-waste production would not remove the need for a repository. A large inventory of spent fuel has been accumulating at reactor sites. According to recent estimates, over 12,000 metric tons of spent fuel currently require disposal and over 130,000 metric tons will require disposal by the year 2020 (DOE, 1984d).

C.2.8.2 Alternatives to geologic disposal

Many comments suggested methods of disposal other than geologic repositories. Other commenters expressed concern that the DOE has not adequately considered all feasible options for disposal, such as disposal in space or beneath the seabed.

Issue

Some commenters wanted to know whether the DOE has considered space as a safe and feasible method for radioactive-waste disposal.

Response

Before deciding on geologic repositories, the DOE evaluated many alternative waste-disposal concepts, including space disposal (DOE, 1980). The DOE, in conjunction with the National Aeronautics and Space Administration (NASA) and others, studied the space-disposal concept, but did not favorably consider launching radioactive wastes into the sun because of excessive fuel requirements. Disposal on the moon was also rejected as an alternative because it might interfere with future lunar exploration. NASA's favored concept was to place high-level waste into a solar orbit about halfway between the Earth and Venus. This concept would use space shuttles to place the packaged waste into the appropriate solar orbit.

While the volume and weight of high-level radioactive waste are relatively small when handled on Earth, the cost would be enormous to launch all of the waste into space. A fundamental requirement for space disposal is to separate the waste into short-lived and long-lived portions. The short-lived waste that would decay to innocuous levels in hundreds of years would be managed on Earth. Only the long-lived waste, which must be isolated for thousands of years, would be disposed of extraterrestrially. Therefore, disposal in space would only reduce, not eliminate, the need for terrestrial waste management.

The results of these studies led the NASA and the DOE to conclude that further study of space disposal is not warranted at this time. The reason for this conclusion was the expected additional cost of space disposal without achieving a significant reduction in long-term risk in comparison with the risk of disposal in a geologic repository. The concept of space disposal will be reconsidered if, at some future time, the DOE's program for waste-disposal technology or space-technology developments by NASA warrant the need for further study.

Issue

The DOE should consider disposal in relatively thick, stable beds of sediments located in deep, quiet, and remote regions of oceans or disposal in volcanic trenches throughout the world.

Response

The DOE is sponsoring a subseabed-disposal project as part of a multinational effort through Fiscal Year 1986. The disposal of high-level waste in the oceans has never been practiced by the U.S. Government and was prohibited by the Marine Protection, Research, and Sanctuaries Act of 1972 and under the London Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter. The uncertainties and issues to be resolved regarding subseabed disposal are significant, and efforts to resolve them are under way.

Issue

A number of comments requested the DOE to start over with a safe answer to the problem of radioactive-waste disposal. It was noted that the concept of geologic repositories was developed in the 1950s. Many comments suggested that the DOE should accept new technology as it becomes available, and some commenters said that research and development on alternative methods of disposal should continue.

Response

A number of methods for the disposal of high-level radioactive waste have been examined by the Federal Government during the past 10 years, including subseabed, deep-hole, ice-sheet, and outerspace disposal. Of these alternative technologies, only subseabed disposal is currently funded by the DOE. The remaining alternative concepts were found to have no obvious advantages over geologic disposal. The primary consideration in evaluating these alternative technologies was public health and safety. The state of

technology, the potential environmental impacts, and suitability for spent-fuel disposal have been studied for each of these methods and are discussed in the final environmental impact statement for the management of commercially generated radioactive waste (DOE, 1980).

C.2.8.3 General technical issues

A number of comments addressed technical issues that are not site specific. There were a large number of such issues, and they covered a broad range of subjects, including the accuracy and conservatism of the analyses used in the PAs, conditions at the repository site after closure, etc.

Issue

Some persons asked whether a large number of small disposal facilities would be safer.

Response

No clear reduction in risk would result from using a large number of smaller repositories. No net advantages would be realized in terms of monitoring the performance of the repositories. While there may be some reductions in costs of transportation, these would be greatly outweighed by the extra cost of finding and qualifying a larger number of repository sites and developing many repositories.

Issue

Several commenters felt that a burden is placed on future generations for the disposal of the wastes.

Response

Geologic disposal was chosen for high-level waste and spent fuel because it minimizes the potential burden on future generations. Once the repository is closed, there is no need for maintenance. The use of geologic formations as barriers to radionuclide migration helps to ensure that there will be no significant health burdens to future generations even if the waste containers are eventually breached.

Issue

Some commenters said that the DOE needs to consider how it will prevent human intrusion over the long term.

Response

The DOE feels that human intrusion can be prevented through prudent siting in locations that have few, if any, natural resources and through institutional management. Several years ago, the DOE convened a human-interference task force to determine whether reasonable means exist (or

could be developed) to reduce the likelihood of unintentional human intrusion into a repository. The task force concluded that a significant reduction in the likelihood of human intrusion could be achieved, for perhaps thousands of years into the future, if appropriate steps are taken to communicate the existence of the repository to future generations.

Issue

One person asked whether the conclusions in the EA on compliance with the guidelines are supportable.

Response

At the steps of site nomination and recommendation, the requirement for disqualifying conditions is evidence that does not support a finding that the site is disqualified. Likewise, the qualifying conditions are deemed to be present if the evidence does not support a finding that the site is not likely to meet the qualifying condition. The DOE believes that the available data and analyses for each site indicated that no site has a disqualifying condition and that all sites are likely to meet all the qualifying conditions.

Issue

One commenter asked whether the DOE can guarantee that no new mutations will occur from the waste-emplacement practices.

Response

Absolute guarantees are hardly ever possible, but the DOE believes that new mutations are extremely unlikely because there is very little likelihood that radioactive materials from the repository will reach the human environment.

Issue

One person asked whether the hydrogeologic conditions will be known well enough to make predictions over 10,000 years or more.

Response

At the time of application for a license for the repository, which comes after thorough site characterization, the hydrogeologic environment at the site will be well known. Not only will nominal values be determined for the parameters needed to predict the migration of radionuclides from the repository but also the uncertainties in those values due to measurement uncertainties and nonhomogeneous rock properties will have been determined.

Issue

One party asked whether the DOE plans to close the site without subsequent monitoring or retrieval.

Response

The DOE currently plans to be able to begin retrieval for up to 50 years after the start of waste emplacement and to monitor the site for some period, not determined at present.

Issue

One commenter noted that canisters need to stay intact for 300 years but monitoring will be for 50 years.

Response

The monitoring referred to by the commenter apparently is the 50-year period of waste retrievability and plans to monitor selected individual waste containers until the repository is closed; the objective of monitoring individual containers is to confirm their performance. Monitoring the containers after repository closure would be very difficult and could compromise the performance of the repository as a whole.

Issue

Some persons asked about the measures that will be used to protect the integrity of the controlled area for long periods after closure.

Response

At present, placing some form of physical markers around the site is the most likely method for notifying future societies of the presence of a repository. In addition, records will be kept.

Issue

Hanford will be accepting 60 percent of the Nation's defense waste.

Response

Whatever site is chosen for the first repository, it will receive up to 10,000 metric tons uranium equivalent of defense high-level waste.

Issue

One commenter said that phased repository construction will circumvent the NRC's requirement to review and approve complete site construction before accepting any waste for disposal.

Response

The Act (Section 114(d)) states that "the Commission shall consider an application for construction authorization for all or part of a repository...." Therefore the Act does not prohibit authorization for phased construction. The DOE has discussed this concept with the Nuclear Regulatory Commission and has received no objections to the concept. The sequence of license applications is described in the Mission Plan (DOE, 1985a).

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C.3 SITING PROCESS AND DECISIONS

This section addresses comments on the siting process and decisions. It covers issues related to site screening and the siting guidelines (Section C.3.1), the evaluation of sites against the disqualifying conditions of the guidelines (Section C.3.2), the grouping of sites into geohydrologic settings and the selection of the preferred site for each setting (Section C.3.3), and the nomination and recommendation of sites for characterization (Section C.3.4). The section on nomination and recommendation is concerned with general issues related to the DOE's approach in selecting the sites proposed for nomination and recommendation in the draft EAs and with issues related to the comparative evaluation and ranking of sites. It does not include issues related to the evaluations of individual sites; these issues are addressed in Sections C.5 though C.8. With a few exceptions, Section C.3 addresses comments on Chapters 1, 2, and 7 of the draft EAs.

C.3.1 SITING GUIDELINES AND SITE SCREENING

Addressed in this section are comments on the DOE's siting guidelines, published as 10 CFR Part 960 on December 6, 1984 (DOE, 1984), and comments on site-screening issues. The latter are divided into two parts: general site-screening issues (Section C.3.1.2) and issues specific to a particular host rock or site (Section C.3.1.3).

C.3.1.1 The siting guidelines

Most of the comments on the DOE's siting guidelines (10 CFR Part 960) addressed general issues like the development of the guidelines, the timing of their publication, and their adequacy. These are summarized and answered in Sections C.3.1.1.1, C.3.1.1.2, and C.3.1.1.3, respectively. Comments on specific guidelines are covered in Section C.3.1.1.4.

C.3.1.1.1 Development of the guidelines

The development of the guidelines drew comments and questions from several parties who were concerned about the derivation of the guidelines, the level of State involvement, and the content of the guidelines.

Issue

Several parties questioned the origin and the derivation of the guidelines.

Response

After the Act was passed, the DOE assembled a task force of program experts to prepare proposed guidelines. The task force began by considering the criteria used earlier in the National Waste Terminal Storage (NWTS)

Program, including program objectives, system-performance criteria, and site-performance criteria (DOE, 1981, 1982); other sets of criteria defined for geologic repositories by the National Academy of Sciences (NAS-NRS, 1978), the International Atomic Energy Agency (IAEA, 1977), and earlier programs in the United States (Brunton and McClain, 1977; DOE, 1980); advance information made available by the NRC (1980); and the requirements of the Act.

In the development the proposed guidelines, great care was taken to make them compatible with the existing applicable regulations of the Environmental Protection Agency (EPA), published as 40 CFR Part 190 (EPA, 1977) and the Nuclear Regulatory commission (NRC), published as 10 CFR Part 20 (NRC, 1960) and with the regulations that had been recently proposed by the NRC and the EPA concerning the disposal of high-level radioactive waste and spent nuclear fuel in geologic repositories. The NRC had by then nearly completed the pertinent technical criteria for geologic repositories, 40 CFR Part 60 (NRC, 1982), and the EPA had issued, for public comment, proposed environmental standards, 40 CFR Part 191 (EPA, 1982).

Several draft versions of the siting guidelines were released: the proposed guidelines of February 1983 and the alternative guidelines of May 1983, both of which were issued for review and comment by the States, affected Indian Tribes, and the public; the revised guidelines of August 1983, which served as a basis for additional consultation with States, Indian Tribes, and Federal agencies; and the revised guidelines of November 1983, which were sent to the NRC for concurrence. The NRC held several meetings on the guidelines at which the DOE, States, affected Indian Tribes, and Federal agencies presented comments.

The revisions that resulted from this comment and consultation process are discussed in the "Supplementary Information" for the guidelines (DOE, 1984, pp. 47714-47751) and in the comment-response document for the guidelines (DOE, 1983). After NRC concurrence, the guidelines were published in final form (December 1984), and many copies were distributed to States, Indian Tribes, and the public.

Issue

Some commenters asked about the level of State involvement in developing the guidelines.

Response

As explained in the "Supplementary Information" for the guidelines (DOE, 1984, pp. 47717-47720), the siting guidelines were developed after two formal public-comment periods and two rounds of consultation with the interested States, including both separate meetings with individual States and plenary sessions. The comments submitted by the States on the proposed guidelines of February 7, 1983, led to a division of the guidelines into postclosure and preclosure guidelines and to the addition of the implementation guidelines. Many other changes were made to the guidelines in response to comments from the States. In addition, the States and Indian Tribes had opportunities to provide comments to the NRC during the concurrence process.

Issue

One commenter asserted that the DOE intentionally slanted the content of the siting guidelines to favor the selection of a particular site.

Response

The guidelines were not prepared with the intent of selecting any particular site for the first repository. The purpose of the guidelines is to provide an objective framework for ensuring that potential repository sites meet the standards established for radioactive-waste disposal.

C.3.1.1.2 Time of publication

A number of comments addressed the timing of the publication of the siting guidelines, both in relationship to the site-screening process and the publication of the pertinent EPA and NRC regulations.

Issue

Several commenters inquired why the publication of the final siting guidelines was delayed.

Response

The DOE realized that it was important to get public and State input on the content of the guidelines. This was a time-consuming process, but the DOE thought that the additional time required for this review was warranted in light of the benefits received.

Issue

Several commenters questioned how the nine potentially acceptable sites for the first repository could be identified before the final siting guidelines were issued and argued that the guidelines should have been issued before the identification of potentially acceptable sites.

Response

When the Act mandated the preparation of the guidelines, the DOE had already identified nine sites as potentially acceptable for the first repository; the screening that led to them had been based on criteria defined by the National Academy of Sciences (NAS-NRC, 1978), the International Atomic Energy Agency (IAEA, 1977) and earlier programs in the United States (Brunton and McClain, 1977; DOE, 1980). The DOE believes that Congress did not intend this screening to be repeated on the basis of the new guidelines required in the Act. Section 116(a) of the Act requires that, within 90 days of its enactment, the DOE identify the States with potentially acceptable sites and, within 90 days after such identification, notify the States and affected Indian Tribes of the potentially acceptable sites within their jurisdictions. Such a notification would be impossible if Congress had intended a repetition

of the screening against the guidelines, which were to be issued within the first 180 days. The screening that led to the nine potentially acceptable sites did not use the guidelines per se, but it was based on the same principles. The guidelines have been and will be used in the remainder of the site-selection process for the first repository and for screening potential sites for the second repository.

Issue

Several commenters contended that the guidelines should not have been developed before the promulgation of the EPA standards and the NRC criteria for geologic disposal because the guidelines are based on compliance with the EPA standards and the NRC criteria.

Response

The Act did not allow the DOE to delay the guidelines until the publication of the NRC and the EPA regulations. It required the DOE to issue guidelines within 180 days of the enactment of the Act (i.e., in August 1983), whereas the NRC and the EPA were to issue their regulations by January 1, 1984, and January 7, 1984, respectively.

However, the guidelines were based on proposed EPA and NRC regulations. Their compatibility with the NRC's 10 CFR Part 60, which was published in final form on June 21, 1983 (NRC, 1983), has been verified by the NRC, which used absence of conflict with 10 CFR Part 60 as one of the criteria for its concurrence on the guidelines. Throughout the guideline-development process, the DOE was able to review the working drafts of the EPA's 40 CFR Part 191 to ensure absence of conflict. The final EPA rule, published on September 19, 1985 (EPA, 1985), is not in conflict with the guidelines. As explained in the "Supplementary Information" for the guidelines (DOE, 1984, p. 47721), in the event of any future conflict between the guidelines and either 10 CFR Part 60 or 40 CFR Part 191, these NRC and EPA regulations will supersede the guidelines and constitute the operative requirement in any application of the guidelines. The guidelines also contain provisions for their amendment to maintain compatibility with the NRC and the EPA regulations.

C.3.1.1.3 Adequacy of the siting guidelines

Many of the comments received on the guidelines addressed the adequacy of the guidelines. The issues raised ranged from doubts about the ability of the guidelines to protect public health and safety to suggestions for revising the guidelines.

Issue

A number of comments expressed doubt that the guidelines would protect public health and safety and the quality of the environment.

Response

The siting guidelines are based on compliance with the EPA standards for the geologic disposal of radioactive waste (40 CFR Part 191) and the NRC criteria for implementing the EPA standards (10 CFR Part 60). Protection of the health and safety of the public and the quality of the environment is the basic objective of both the EPA and the NRC regulations.

Issue

Several commenters requested that "proximity" be included as a factor in selecting and evaluating potential repository sites, and one commenter questioned why proximity to dedicated lands is not a disqualifying condition.

Response

Proximity is included as a factor in the preclosure guidelines on population density and distribution, offsite installations and operations, the environment and transportation. Proximity is also implicit in the third disqualifying condition on the environment, which is concerned with the previously designated resource-preservation use of National or State parks, forest lands, etc.

Issue

Some parties said that, because no sites have been disqualified, the validity of the guidelines is questionable.

Response

The nine potentially acceptable sites for the first repository were identified in a site-screening process that evaluated regions, areas, locations, and potential sites against various criteria that were based on the same principles as the siting guidelines. One of the objectives of this process was to eliminate sites that do not merit the investment necessary for detailed studies and site characterization. It is therefore not surprising that none of the sites identified as potentially acceptable have not been disqualified in evaluations against the guidelines.

Issue

The guidelines were criticized by some parties for failing to specify procedures for verifying findings.

Response

The guidelines are intended to provide the framework for a site-screening and site-selection process that can lead to the selection of suitable sites. They do not contain any procedures for the conduct of site screening, methods of date collection and analysis, etc. Such procedures will be included in other documents, such as the site-characterization plans. The plans for site characterization will be reviewed by the NRC and the affected State, and the information collected during site characterization will be reported to the NRC every 6 months. The final determination of the suitability of any site will be made by the NRC.

Issue

Some comments alleged that, because the guidelines may be challenged by litigation, the EA findings are tenuous.

Response

As explained in Section C.3.1.1.1, the siting guidelines were developed through a process of extensive consultation with the States and affected Indian Tribes and review by the public. As required by the Act, they received the concurrence of the NRC. The DOE is therefore confident that litigation challenges will not bring about any significant changes in the guidelines or require changes in the EA findings.

Issue

The DOE was advised that the controlled area and the accessible environment should be defined before site characterization begins.

Response

The DOE siting guidelines define the accessible environment as the atmosphere, the land surface, surface water, oceans, and the portion of the lithosphere that is outside the controlled area.

The definition of the controlled area is derived from the NRC's 10 CFR Part 60 (NRC, 1983); it establishes an area of no more than 10 kilometers (6 miles) around a repository that is to be identified by markers, records, and other possible institutional controls intended to exclude incompatible activities from the area. The EPA's final standard in 40 CFR Part 191 (EPA, 1985) establishes a more restrictive definition of controlled area: it limits the controlled area to 5 kilometers in any direction from the outer boundary of the original location of the waste in a repository. Furthermore, the controlled area is also limited to 100 square kilometers, which is approximately the area that would be extend for a distance of 3 kilometers from all sides of an undergound repository in a typical configuration. The EPA definition thus substantially reduces the area of the lithosphere that would be contained if the controlled area and thus decreases the distance to accessible environment. The 5-kilometer distance was chosen to retain reasonable compatibility with the NRC's requirement that the pre-waste-emplacement time of ground-water travel to the accessible environment be at least 1,000 years.

Issue

The adequacy of the guidelines for the ranking of sites was questioned.

Response

As explained in the multiattribute utility analysis of nominated sites, the DOE developed a revised method for using the guidelines to rate the technical adequacy of sites. This method has been reviewed by the National Academy of Sciences and other peer reviewers.

Issue

Some parties suggested that the guidelines should establish procedures for determining the end point of site characterization.

Response

The end point of site characterization will be established by the site-characterization plans, which will describe in detail the tests to be performed, the data that are needed, and what the data will be used for. Each plan will be specific to a particular site and will be based on the data and analyses needed to resolve outstanding issues about the suitability of the site. Because the end of site characterization depends on site-specific conditions, it cannot be defined by general siting guidelines. As already mentioned, these plans will be reviewed by the NRC, the affected States and Indian Tribes, and the public through a formal hearing process. The data collected during site characterization will be reported to the NRC every 6 months in progress reports that will also discuss any needed changes in the plans for testing. After site characterization is completed, the NRC may request the DOE to collect more data for the confirmation of the results of site characterization.

Issue

One commenter suggested that the potential impact on system performance by discrete hydraulic features (joints, faults, fractures, and dissolution conduits) be incorporated into the DOE guidelines and the EAs.

Response

The impact on system performance of discrete hydraulic features is not included in the guidelines because the guidelines must be general enough to cover all types of host rock. The impacts of such features, if they are present, will be assessed during site characterization.

C.3.1.1.4 Comments on particular guidelines

Issue

The guideline concerning the 10,000-year travel time from the repository to the accessible environment is not appropriate for radioactive waste that will be subject to dispersive and diffusive mixing processes.

Response

A 10,000-year travel time to the accessible environment is a favorable condition in the postclosure guidelines on geohydrology; it was derived from the NRC's criteria in 10 CFR Part 60. The qualifying condition for geohydrology says that the present and expected setting of a site shall be compatible with waste isolation, taking into account the characteristics of, and the processes operating within, the geologic setting.

Issue

Ground-water modeling should be specified in the postclosure guideline on geohydrology (and the EAs) as a screening tool rather than as a predictive tool. Modeling results should not be substituted for "hard data" where inadequate data would make verification impossible.

Response

As already mentioned, the guidelines are not intended to specify procedures for data collection, data analysis, or performance assessment. Detailed information on the technical approach will be presented in the site-characterization plans.

Issue

Some commenters asked why the technical guideline on preclosure site ownership and control is assigned to the system guideline for preclosure radiological safety instead of ease and cost of construction, operation, and closure.

Response

The primary purpose of the preclosure guideline on site ownership and control is to ensure compliance with the NRC's requirement that the DOE obtain ownership as well as surface and subsurface rights to land and minerals within the controlled area of the repository (10 CFR 60.121). The objective of this requirement is to protect the general public from any radioactivity that might be released in the repository, and hence this guideline is concerned mainly with preclosure radiological safety. The system guideline on the ease and cost of repository siting, construction, operation, and closure, on the other hand, is concerned with the use of reasonably available technology and assurance that the cost of siting, constructing, operating, and closing a repository at a particular site is reasonable in comparison with the costs of other available and comparable siting options.

C.3.1.2 General site-screening issues

Summarized and addressed in this section are comments on several generic site-screening issues: the site-screening process, the importance of host-rock diversity, the selection of sites on the basis of land use, and the screening for sites in salt. In addition, this section includes comments on particular siting issues, such as proximity to a national park.

C.3.1.2.1 Use of ambiguous criteria and lack of uniformity

The site-screening process was criticized because it allegedly varied from site to site and because host rocks other than basalt, salt, and tuff were not considered.

Issue

One party alleged that Chapter 1 of the draft EAs reveals the site-screening process to be full of ambiguously defined criteria, arbitrary cutoffs, and site deferrals and said that the criteria used to eliminate sites were aimed at reaching an arbitrary number of sites rather than eliminating inferior ones. Size was cited as one such arbitrary factor, particularly the 2,000-acre minimum that led to the elimination of three salt-dome sites.

Response

The criteria used in screening for potentially acceptable sites were based on waste-isolation requirements, natural processes and conditions that could affect isolation, engineering design requirements, and factors particular to the rock type under consideration (i.e., dome size is pertinent only to salt domes). The size criterion, for example, was derived from repository designs and NRC requirements. The three domes were eliminated because the 2,000-acre criterion was established during the time the salt domes were being screened.

Chapter 1 of the EAs only highlights the site-screening processes. For a complete description of the processes, the supporting references cited in Chapter 1 should be consulted.

Issue

The DOE was advised to begin the national screening process for the first repository again, implementing a uniform process for all sites.

Response

To begin another national screening process for the first repository would violate the requirements of the Act, which specifies that the potentially acceptable sites for the first repository be identified at the time the guidelines are issued--within 180 days of the enactment of the Act. The requirement for the identification of potentially acceptable sites was derived from the recognition by Congress that the DOE had been conducting screening studies for several years. As explained in the "Supplementary Information" for the guidelines (DOE, 1984), the screening processes were based on principles similar to the guidelines.

Issue

Several commenters questioned why granite, considered by countries like Sweden as the best rock for a radioactive-waste repository, or argillaceous rocks (shale) are not being considered for the first repository.

Response

Because basalt, salt, and tuff are suitable host rocks for waste isolation, screening in these rocks had identified promising sites, the cost of characterizing more than three sites for the first repository seemed unwarranted, and the Act required potentially acceptable sites to be

identified within 180 days, the DOE decided to reserve granite for the second repository. Thus, studies of granite, a crystalline rock, have not progressed as far as studies of other host rocks. Several years will be required to identify potentially acceptable sites in crystalline-rock formations and to collect for such sites as much information as is available for the basalt, salt, and tuff sites in order for all sites to be considered on a comparable basis.

Argillaceous rocks at the Nevada Test Site were considered for the first repository in the late 1970s. As explained in Chapter 2 of the EA for the Yucca Mountain site, general studies were made of low-permeability shale, and detailed studies were made of the argillite-rich Eleana Formation. However, because the argillite rock was judged to be too complex for characterization, further consideration was suspended.

C.3.1.2.2 Importance of host-rock diversity

The DOE was criticized by some commenters for using the diversity of host rocks as a requirement in the site-screening process. Conversely, other commenters wanted to know why screening for the first repository was limited to basalt, salt, and tuff.

Issue

There were objections to the importance assigned to host-rock diversity. The requirement for diversity automatically places the Hanford and the Nevada sites in the top five and makes it possible for technically superior sites to be overlooked in favor of sites in different settings. (See also Section C.3.3 for comments and responses on geohydrologic settings.)

Response

The need to recommend and characterize sites in different host rocks is well established in the NRC requirements (10 CFR Part 60) to characterize three sites in two host rocks, at least one of which is not salt; in the requirement of the Act that, to the extent practicable, the DOE recommend sites in different host rocks; and in Section 960.3-1-1 of the siting guidelines. The consideration of alternative host rocks is also implicit in the requirements of the National Environmental Policy Act (NEPA). The DOE is nominating a set of sites that meet both the NRC's technical criteria in 10 CFR Part 60 and requirements for a diversity of host rocks. Without diversity, the discovery of a generic flaw in some particular host rock during site characterization would lead to unacceptable delays in the siting process.

C.3.1.2.3 Selection of sites on the basis of land use

Many comments addressed the screening of sites on Federal lands and the identification of the Hanford site in Washington and the Yucca Mountain site in Nevada as potentially acceptable on this basis.

Issue

Commenters said that the Hanford and the Nevada sites were selected on the basis of Federal ownership rather than geologic superiority, whereas the Act requires that geologic conditions be the primary criteria.

Response

Geologic conditions are the primary criteria. However, the DOE used two approaches to screening for geologically suitable sites for the first repository. One approach began with the identification of salt as a potentially suitable host rock and proceeded with a screening process that narrowed the size of the land unit under consideration from regions to sites.

The other approach began with the evaluation of certain Federal lands that are dedicated to nuclear-energy operations to see which contain potentially suitable host rocks; it led to screening at Hanford and at the Nevada Test Site. This approach was endorsed by the Comptroller General of the United States (General Accounting Office, 1979) and by a resolution by the House of Representatives (1979). Although land use formed the initial basis for the screening of Federal lands, the subsequent progression to smaller land units was based on evaluations of geologic and hydrologic suitability, using criteria that are similar to the siting guidelines. Since the publication of the guidelines, the evaluations of these sites have been based on the guidelines. If the results of site characterization cause a site on Federal land to be disqualified because of geologic conditions, the site would be dropped from consideration regardless of land ownership.

Issue

Some commenters asked why the DOE did not investigate government-owned sites other than Nevada and Hanford and other sites already set aside for nuclear-energy activities.

Response

Other DOE-owned sites dedicated to nuclear-energy activities were considered. However, the geologic and hydrologic conditions at the other sites did not seem as favorable as those of the Hanford Site and the Nevada Test Site. In addition, preliminary investigations of the Hanford Site and the Nevada Test Site had been conducted for defense programs, and experienced staff were available to assist in repository-site investigations. Another reason for choosing the Hanford and the Nevada sites for site screening is their large geographic area, which increases opportunities for finding sites with favorable combinations of geologic and hydrologic characteristics. For example, the large size of the Nevada Test Site allowed preliminary investigations in nine different host rocks in saturated and unsaturated environments before it was shown that the unsaturated environment in tuff was preferred to other geologic environments at Nevada.

C.3.1.2.4 Screening for sites in salt

There were a number of comments on the screening of sites in salt. Some of them questioned the suitability of salt, in general, whereas others asked about particular regions or sites.

Issue

Some commenters said that the EAs should explain why salt is the best host rock or the relative advantage of salt domes and bedded salt. They said that salt seems to be a candidate because it is the most-studied host rock rather than the best host rock, and its suitability has been questioned.

Response

Salt was recommended as a potentially suitable host rock for waste disposal in 1955 by the National Academy of Sciences-National Research Council (NAS-NRC 1957), which made this recommendation after evaluating many options. This recommendation was reaffirmed in a subsequent report (NAS-NRC, 1970) and endorsed by the American Physical Society (1978).

The characteristics of salt that are favorable for waste isolation are discussed in Section 1.2.2 of the EAs. The features of salt beds and salt domes were described in Section 1.3.2.2 of the EAs and in the DOE's Mission Plan (DOE, 1985, Vol. I, Part I, Chapter 5). The DOE has never claimed that salt is the "best" host rock for waste isolation. All of the host rocks considered for repositories have both advantages and questions to be resolved.

Issue

One commenter wanted to know why the Salina Basin was deferred for further study even though it is closer to a larger number of reactors than other salt sites and its selection would alleviate the problem of transporting waste over long distances.

Response

The Salina region includes portions of Michigan, New York, Ohio, Pennsylvania, West Virginia, and Canada. Regional analyses had indicated that bedded salt potentially suitable for a geologic repository occurs in Michigan, northeastern Ohio, and a portion of northwestern New York. Plans for field investigations in Michigan were halted in 1977 because of the enactment of a State law (Public Act 113) barring the disposal of high-level radioactive wastes in the State. Regional studies of the Salina Basin based on the geologic literature and geologic data from public and private sources were completed in 1978. These studies identified study areas for field investigations in New York and Ohio, but no field work was carried out for the reasons explained below.

The studies of the Salina region were not specific or detailed enough to judge that any part of the region was suitable or unsuitable for a repository. They did reveal, however, unfavorable characteristics in several parts of the basin. Among the most important was the high population density

and the concentration of urban areas (more than 50,000 inhabitants) in Ohio and southern Michigan. Another was the abundance of natural resources, especially the oil and gas deposits in Ohio and throughout the Michigan Basin. When the State of Ohio objected to further studies, the DOE was in the process of examining its goals and objectives in the management of radioactive waste and had begun investigations of alternative host rocks (basalt and tuff). Evaluations of salt were restricted to the Permian Basin of Texas, the Paradox Basin in Utah, and the salt domes in the Gulf interior region of Louisiana and Mississippi.

Issue

The DOE needs to discuss why the first two sites selected in the salt-screening process--Lyons, Kansas, and the WIPP site--were rejected and are not even mentioned in the description of the siting process.

Response

The site at Lyons, Kansas (an already existing salt mine), was used by the Atomic Energy Commission (AEC) from 1965 to 1967 for a large-scale experiment with simulated waste and electrical heaters. The purpose of this experiment, called Project Salt Vault, was to observe the response of salt beds to heat. In June 1970, the Lyons site was selected as a potential location for a geologic repository; the selection, however, was conditional on the satisfactory resolution of site-specific issues under study. The concept and the location were conditionally endorsed in November 1970 by the waste committee of the National Academy of Sciences. A conceptual design for a repository was completed in 1971. In 1972, however, the Lyons site was judged to be unacceptable for technical reasons: there were previously undiscovered drill holes nearby, and some water used in nearby solution mines could not be accounted for. Accordingly, the AEC decided to abandon Lyons as a demonstration site and to search for sites elsewhere.

In 1974, field investigations for a site for the Waste Isolation Pilot Plant (WIPP) were begun in the northern part of the Delaware basin in New Mexico. Selected by the Oak Ridge National Laboratory, the site was on the Eddy-Lea County line, about 30 miles east of Carlsbad. However, drilling and geophysical investigations produced unexpected results showing that the geologic structure appeared to be unpredictable because of proximity to a major aquifer. The structure could have been delineated by more drilling, but extensive drilling would have been contrary to the principle of minimizing the number of holes drilled into the repository. That site was therefore given up, and a new survey for sites in the New Mexico portion of the Delaware basin was begun by the U.S. Geological Survey and the DOE's predecessor, the Energy Research and Development Administration. In 1975, these efforts led to the identification of a site in the Los Medanos area, about 25 miles east of Carlsbad. The Waste Isolation Pilot Plant now being constructed there has been designated (by Public Law 96-164) a research-and-development facility for the national defense effort (to demonstrate the disposal of high-level waste) and for the disposal of defense transuranic waste. This plant is not part of the DOE's program for the management of commercial radioactive waste.

C.3.1.2.5 Particular siting issues

A number of comments addressed particular siting issues, such as proximity to a national park or the potential for contaminating water supplies.

Issue

The DOE was urged not to consider a repository site near a national park.

Response

The DOE recognizes its responsibility to protect the national parks from irreconcilable conflicts. According to the siting guideline on environmental quality, if the "presence of the restricted area or the repository support facilities would conflict irreconcilably with the previously designated resource-preservation use of a component of the National Park System," the site would be disqualified.

Issue

Some persons were concerned that a repository would contaminate water supplies and nearby rivers, thus adversely affecting the water supply of downriver populations.

Response

Water supplies and nearby rivers are protected by EPA and NRC regulations, which require complete containment of all radioactive material for 1,000 years and limit any releases thereafter to extremely low rates that would pose no hazard to public health or safety. Requirements for ground-water protection are explicitly included in the EPA's final standards (EPA, 1985).

Issue

Several comments said that a repository should not be located near prime farmland.

Response

The siting guidelines provide a number of opportunities to evaluate the potential impacts of a repository site on prime agricultural lands. For example, the preclosure guideline on socioeconomics says that the "potential for major disruptions of primary sectors of the economy of the affected area" is a potentially adverse condition. The DOE is concerned about impacts on prime agricultural lands and will not select any site that would irreconcilably damage farm capability.

Issue

Many commenters wanted to know why the DOE is continuing to consider the Hanford site. They claim that the highly fractured basalt rock has been shown to be a poor host rock for a repository.

Response

The Hanford site and the basalt host rock have many favorable characteristics for waste isolation and some questionable characteristics, just as the other rock types have. The DOE recognizes that the hydrologic conditions of the Hanford site are an important issue, but the results of studies conducted since 1976 have not revealed any technical reasons for finding the site unacceptable. If Hanford is selected for site characterization, the studies performed will provide the information needed for determining compliance with the siting guidelines and hence NRC criteria and EPA standards.

C.3.1.2.6 Alternative repository locations

Issue

Many commenters suggested alternative repository locations with particular characteristics (e.g., location away from populated areas, in an arid desert, or on barren government-owned land) or recommended specific sites.

Response

The characteristics suggested by the commenters are considered favorable conditions in the siting guidelines. However, the geologic conditions that are important to waste containment and isolation after repository closure are the primary considerations. No single site characteristic is sufficient because each site must meet the qualifying conditions of every guideline. While other possible repository locations may possess particular characteristics that are favorable, the DOE is confident that the sites being considered for the first and the second repository possess the combination of characteristics needed for compliance with the DOE siting guidelines and with the regulations promulgated by the EPA and the NRC for the protection of public health and safety.

C.3.1.3 Site-specific site screening issues

Comments concerning site-specific and site-screening issues were divided into three categories: (1) screening for the Yucca Mountain site, (2) comparative evaluation of sites, and (3) issues related to the executive summary.

C.3.1.3.1. Screening for the Yucca Mountain site

The comments on screening were divided into seven issues: (1) the screening process, (2) site conditions, (3) data and documentation for the screening process, (4) the adequacy of data base, (5) requests for clarification, (6) land ownership by the Western Shoshone Tribe, and (7) miscellaneous.

Issue

Nine commenters questioned the screening process, particularly the relationship between the early screening process that resulted in Yucca Mountain being considered and the later decision to choose the unsaturated zone. The EA was interpreted as saying that nine rock types were considered in the early site screening instead of the three actually used. The policy that led to the selection of Yucca Mountain (outside the Nevada Test Site) was also questioned on the grounds that the screening was restricted to areas within the boundaries of the Nevada Test Site. Also questioned was the applicability of the early judgments about the attractive attributes of Yucca Mountain in light of data obtained later in the screening process. Other commenters expressed concern that the site was chosen more for political and policy reasons than for ability to isolate the waste, and one of them asked whether all potential sites in Nevada had been considered as implied.

Response

The comprehensive documentation of the technical basis for the assumptions and data used in the screening study provides adequate support for an unbiased set of conclusions. As already mentioned, geologic and hydrologic conditions were the primary reasons for selecting Yucca Mountain within the area considered by the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. The earlier investigation of the Nevada Test Site were begun, it is ture, beacause the site was on Federal lnads dedicated to nuclear activities, but even then geologic criteria were primary. The final EA has been changed to remove the unintended implication that all sites in Nevada were considered.

The unsaturated zone was selected as a target emplacement environment after the decision to focus exploration on Yucca Mountain. The formal screening study considered saturated and unsaturated environments throughout the screening area, not just at Yucca Mountain, as shown in Figure 2-11b of the draft EA. The unsaturated Topopah Spring Unit was one of the most favorably rated and subsequently, during the host-rock selection process (Section 2.2.5 of the draft EA), became the preferred option at Yucca Mountain. To date, no flaws have been discovered that would make the saturated zone at Yucca Mountain an unacceptable alternative.

As explained in the EA, nine rock types were considered in the formal screening study (Sinnock and Fernandez, 1982) that followed the earlier, less formal exploration activities, which considered only granite, argillite, and tuff (Sinnock et al., 1984).

Part of Yucca Mountain is indeed outside the boundaries of the Nevada Test Site; however, this is not incompatible with the siting policy of the formal screening area shown in Figure 2-8 (map of the area on and adjacent to the Nevada Test Site within which screening for repository locations was conducted) of the draft EA was designated by the DOE in July 1981.

The attributes listed in Section 2.2.1 of the draft EA are general characteristics of the Nevada Test Site region and are not intended to imply that all sites in the region possess all the characteristics. These characteristics were the initial reasons for believing that potential sites might exist near the Nevada Test Site.

Issue

One commenter stated that the draft EA incorrectly implied that in deep water table was the primary reason for the start of investigations at Yucca Mountain.

Response

The identification of Yucca Mountain as a potentially acceptable site is described in Section 2.2 of the EA. The paragraph referred to in the comment was not meant to imply that the site was selected because of ground-water conditions in the Yucca Mountain area.

Issue

One commenter erroneously stated that "bedded tuffs" contain numerous cooling cracks that "store and transmit" water.

Response

Bedded tuffs actually tend to be nonfractured because these are relatively nonbrittle. Their fracture frequencies are much lower than those of welded tuffs; matrix transport is the dominant flow mechanism.

Issue

Several commenters asked that more information, data, or documentation be supplied on (1) the surfacemapping methods used to indicate areas large enough for a repository, (2) the endorsement by the National Academy of Sciences (NAS) of the continued study of tuff, (3) the recommendation by the U.S. Geological Survey (USGS) of Yucca Mountain as a potential repository, and (4) how the rating system used in the formal screening process accounted for three-dimensional differences among the alternative locations. One of these commenters also asked why drilling outside the Nevada Test Site was begun in 1978 before the NAS endorsement.

Response

The preliminary surface mapping referred to in Section 2.2.3 of the draft EA was published by the USGS as geological quadrangle maps (Christiansen and Lipman, 1965; Lipman and McKay, 1965). Standard mapping techniques (field observations augmented by aerial photographs, sample collection and testing, and topographic contour interpretation) were used to prepare the maps.

A letter from E. F. Gloyna of the NAS National Research Council to S. Meyers of the DOE, dated April 23, 1979 contains the qualified endorsement of the National Academy of Sciences Committee on Radioactive Waste Management to continue the investigation of tuff as a potential host rock for a repository in Nevada, confirming a preliminary oral endorsement given at the close of a meeting held on September 20, 1978, in Washington, D.C. Reference to this letter has been added to Section 2.2.4 of the final EA.

The USGS recommendation to focus exploration at Yucca Mountain is contained in a letter from W. S. Twenhofel of the USGS to R. M. Nelson of the DOE, dated April 24, 1979. This reference has been added to Section 2.2.3 of the final EA.

Three-dimensional variations in physical attributes were accounted for in the formal rating system by geographic maps (horizontal variations) and host-rock properties (vertical variations) (Sinnock et al., 1984). In combination, these maps and properties provided preliminary three-dimensional information for evaluation.

The exploratory drilling in 1978 was conducted within the boundaries of the Nevada Test Site, as shown in Figure 6-2 of the draft EA.

Issue

Some commenters said that the data presented in the draft EA were not sufficient to state with confidence that Yucca Mountain is suitable for a repository. On the other hand, two other parties suggested that the DOE be more positive about the EA data and emphasize the appropriateness of the data.

Response

The purpose of the EA is to present available information about the site as a basis for nominating five sites for the more-detailed investigations conducted during site characterization in accordance with the Act. The data necessary to determine the suitability of three sites for the first repository will be collected during site characterization. According to the Act and the siting guidelines, the data base for the EAs is to consist only of currently available information. The document is the best available assessment of what is known at this time, but because the data are imcomplete, it is necessary and appropriate to tell the readers about the uncertainty associated with the assessment.

Issue

One commenter stated that the draft EA did not adequately address the institutional process associated with Federal; and State jurisdiction and control of the land and water resources needed for the repository.

Federal and State institutional processes are addressed separately in subject-specific sections (see Sections C.4.1.2.3, C.4.1.3.1, C.4.1.3.6, C.7.2.1, C.7.2.6, and C.7.4).

Issue

One commenter said that all site-characterization studies should be completed before the environmental impact statement (EIS) is prepared.

Response

The site-characterization program, on defined in the site-characterization plan to be prepared for each candidate site, will indeed be completed before the EIS is issued. It will end when sufficient data have been gathered to

support site selection on the basis of the siting guidelines. After the EIS is issued, however, the DOE may continue in-situ testing in the exploratory-shift facilities to confirm the data collected earlier.

Issue

One commenter objected that the DOE prejudged environmental consequences in Section 2.3 of the draft EA, which stated that no adverse environmental impact have been identified in the area that would be effected a repository at Yucca Mountain and no such impacts are expected.

Response

Section 2.3 of the EA present an evaluation of the Yucca Mountain site against the disqualifying conditions of the guidelines. The evaluation of the site against the disqualifying condition for the preclosure guideline on environmental quality says that the evidence collected to date indicates that the siting, construction, operation, closure, and decommissioning of a repository at Yucca Mountain would not result in any unacceptable adverse environmental impacts that would threaten the quality of the environment. Section 2.3 does recognize that some impacts are to be expected and lists them. More-detailed discussions of the expected impacts are presented in Chapters 4 and 5. If the Yucca Mountain site is recommended and approved for site characterization, the DOE will collect the environmental data necessary to demonstrate compliance with the qualifying condition of the quideline on environmental guideline.

Issue

A number of commenters provided suggestions for clarifying the text or increasing the preciseness of measurements presented in metric units. One commenter questioned the accuracy of a statement attributed to Snyder and Oliver (1981), while another questioned a reference to the amount of land being withdrawn. One commenter stated that the draft EA reflected the idea that Nevada was part of the geologic "crystalline shield."

Response

All of the comments suggesting revisions for classification were carefully considered and, where appropriate, the EA was revised accordingly.

The statement attributed in Section 2.2.3 of the draft EA to Snyder and Oliver (1981) was corrected in the final EA.

The comments regarding metric measurements were accepted. Section 2.2.3 was revised to correct the imprecise numbers, and the discussion of the first exploratory hole was modified to state the exact depth instead of giving an approximate depth.

The draft EA erroneously stated that it may be necessary to withdraw 50,000 acres of Bureau of Land Management (BLM) land. The actual number is approximately 5,000 acres. Most of the proposed repository surface facilities would be located on Nevada Test Site property while most of the underground portion would extend into BLM land.

The discussion in the EA reports that the oldest rocks anywhere in the Basin (the comment about the cyrstalline shielded is due to a misinterpretation of the text) and Range Province are in cores of mountains and that, if present, the crystalline "basement" complex is part of the "shield."

Issue

A number of commenters stated that the Yucca Mountain site is currently owned by the Western Shoshone Tribe and that the nomination of the site should be withdrawn until the Federal Government can claim absolute ownership.

Response

The U.S. Government views considers that the land now comprising the Yucca Mountain site is federally owned and not subject to any Indian title or right. This position was recently reinforced by the U.S. Supreme Court in its decision in United States vs. Dann (February 20, 1985). In this case, the Supreme Court held that the Western Shoshone Tribe had already received payment in satisfaction of its claim that its ancestral territory, a portion of which included Yucca Mountain, had been taken.

Issue

A commenter asked whether there are any toxic chemical wastes in the proposed repository area and requested information on the actions that would be taken if toxic waste infiltrated into the repository.

Response

No chemical toxic wastes are stored at or near the Yucca Mountain site. Low-level radioactive wastes are at a site south of Beatty, Nevada, which is approximately 20 miles west of Yucca Mountain. Therefore, no chemical wastes are expected to reach the repository infiltration.

C.3.1.3.2 Comparative evaluation of sites

The comments that were received on the discussion in Chapter 7 of the EA were divided into the following issues: (1) geohydrology and climatic changes; (2) geochemistry; (3) tectonics; (4) human interference; (5) preclosure radiological safety; (6) environment, socioeconomics, and transportation; and (7) ease and cost of siting, construction, operation, and closure.

Issue

Four commenters addressed the comparison of the sites against the geohydrology guideline, pointing out that the data base available for the unsaturated zone at Yucca Mountain is inadequate and suggesting that uncertainties are too great to allow conclusions on most of the favorable and potentially adverse conditions. A fifth commenter pointed out the uncertainty in predictions of future climatic conditions.

Response

If the Yucca Mountain site is recommended and approved for characterization, the DOE will gather additional information on the unsaturated zone at Yucca Mountain. The additional data will be used to reevaluate the findings reached on the qualifying and disqualifying conditions of the guidelines to support the selection of the site for the first repository. To compensate for the uncertainty in predictions of future climatic conditions, both expected and unexpected conditions will be examined in conservative analysis of potential effects on waste isolation.

Issue

Three commenters suggested that the behavior of zeolites and clays under thermal conditions (as well as other heat-induced alterations of tuffs) could adversely affect the isolation capability of the site.

Response

Section C.5.2 of this document provides a thorough discussion of the thermal stability of clays and zeolites; it indicates that most zeolites are located outside zones that will experience significant temperature increases. The potential host rock is welded and devitrified and is unlikely to undergo significant heat-induced alteration.

Issue

Ten commenters addressed various concerns about postclosure tectonics at the Yucca Mountain site. The favorable condition for absence of volcanic activity was challenged on the basis of inadequate knowledge of the cyclic nature of igneous and seismic activity. The absence of faulting younger than 40,000 years near Yucca Mountain was challenged, as was the adequacy of the seismic record. One commenter challenged the conclusion that Yucca Mountain is not likely to experience more or larger earthquakes than the region. Several commenters challenged the fifth potentially adverse condition by suggesting that volcanic activity could cause disruption of the ground-water flow system. One commenter noted that regional tilting was not considered by reliance on leveling surveys; a commenter pointed out that tilting could influence hydraulic gradients. A final commenter claimed that the data base is inadequate to support the finding that the site meets the qualifying condition.

Response

Long-term trends in tectonic activity in the western United States and the Basin and Range are relatively well understood. The confidence placed on predictions of future igneous and seismic activity is based on an understanding of the processes involved. The claim that faulting younger than 40,000 years may have occurred near the site is entirely consistent with the wording in Swadley et al. (1983) which states that "younger movement cannot be ruled out." During the postclosure period, earthquakes and fault movement alone are unlikely to caused loss of containment or isolation (see discussion on tectonics disqualifier, Section 6.3.1.7.5 of the EA). There are no indications that the Yucca Mountain site is likely to have larger or more-frequent earthquakes than those that occur in the southern Basin and Range setting.

In a hydrologic system that is dominated by fracture flow, it is unlikely that new faults will cause major changes in flow-system characteristics. Slow regional tilting could alter gradients, but the time periods are such that isolation is not likely to be affected. More information on tilting and warping with rates and directions will become available if site characterization studies are conducted at Yucca Mountain.

Issue

Two comments addressed the exploitation of ground-water resources and its effect on waste isolation.

Response

Ground water at Yucca Mountain is more than 1,500 feet below the surface. Because shallower water sources are available to the west, south, and east, it is unlikely that water would be extracted from directly beneath the site. In addition, the principal contribution to isolation at Yucca Mountain is the thick unsaturated zone, which will prevent radionuclides from reaching the water table for more than 10,000 years (Section 6.4.2 of the EA). For this reason, resource recovery outside the controlled area is highly unlikely to affect the isolation potential of the site.

Issue

Several commenter asked for an explanation of the basis for a statement that energy defense activities taking place in proximity to the Yucca Mountain site are not expected to conflict with repository activities, particularly in regard to radiological safety.

Response

"Conflict with repository activities" pertains to land rights rather than radiological safety. (Land use is discussed under Section 5.2.3 of the EA, and comments about land use are discussed in Sections C.4.1.3.1 and C.7.2.1 of this document.) With specific regard to radiological safety, analyses of construction and maintenance records show that underground tests have had little or no effect on tunnels, and therefore the construction and operation of the repository are not expected to be affected by activities at the Nevada Test Site (NTS), nor are NTS activities expected to result in radiological releases (see Section C.6.4).

Issue

Two commenters felt that discussion of socioeconomic impacts should have been more detailed.

Response

The DOE believes that the discussion is adequate for the purpose of the EA and that the analyses and conclusions are valid and justifiable.

Issue

Four commenters questioned the evaluation of the site against preclosure guidelines for surface characteristics, rock characteristics, hydrology, and tectonics. They were concerned with the permissibility of considering potential for sheet wash; the nature and extent of the potential host rock, and the reason for using rock bolts; and the favorable and potentially adverse conditions for tectonics.

Response

The potential for sheet wash is present at almost all sites in the western United States. In the final EA the DOE has revised the appropriate guideline findings to reflect this condition in surface characteristics (Section 6.3.3.1) and hydrology (Section 6.3.3.3). The areas of potentially suitable rock that could be considered for the lateral expansion of the repository are shown in Figure 6-5 of the EA and are discussed in Section 6.3.3.2.3. Rock bolts are routinely required in underground facilities to ensure worker safety and efficiency. The evaluations of preclosure tectonic conditions have been substantially improved in the final EA, with better support for the conclusions.

C.3.1.3.3 Issues related to the executive summary concerns

Several comments noted inconsistencies between the text of the EA and the executive summary. One commenter stated that the unsaturated zone should not be characterized as dry because of the presence of vadose water. The vertical and lateral extent of the potential host rock was questioned, as was the nomenclature for the types of rocks in the region. One commenter ques- tioned why guideline statements were not identical with those in 10 CFR Part 960. Several commenters stated that guideline summary statements were based on incorrect assumptions in Chapter 6 with regard to seismicity, climatic stability, infiltration, location of zeolite minerals, mineral resource estimates, the water content of the host rock, and estimates of travel times to the accessible environment.

Inconsistencies were also pointed out in the discussions of archaeology, site location and land use (particularly with regard to the Nevada Test Site), socioeconomic effects, transportation, radiological safety, and emergency preparedness.

Response

Many of the concerns expressed in the above comments were addressed by revisions to the executive summary in the final EA. The unsaturated zone should not be referred to as dry, because the moisture content is variable, with an average saturation of 60 percent. Errors in the descriptions of the major rock types in the region surrounding Yucca Mountain were corrected. The comment about the guidelines apparently referred to the "supplementary information" for the guidelines rather than the explanatory material that was included in the text of guidelines themselves.

For responses to the comments regarding incorrect assumptions in Chapter 6 of the EA, the reader should see the following sections in this comment response document: seismicity in C.5.7, climatic stability in C.5.4, infiltration, water content of host rock, and travel-time estimates in C.5.1, location of zeolite minerals in C.5.2, transportation in C.4.1.4 and C.7.3, socioeconomics in C.4.1.5 and C.7.4, and radiation in C.7.2.7.

In answer to questions about the location of the repository facilities, most of the underground repository would be outside the boundaries of the Nevada Test Site, but some surface facilities would be built on land belonging to the Nevada Test Site.

C.3.2 EVALUATION OF DISQUALIFYING CONDITIONS

No comments in the evaluation of the Yucca Mountain site against the disqualifying condition of the guideline, as summarized in Section 2.3 of the EA, were received.

C.3.3 DIVERSITY OF GEOHYDROLOGIC SETTINGS AND THE SELECTION OF PREFERRED SITES

The DOE's emphasis on a diversity of geohydrologic settings and the selection of the preferred site in each setting were the topics of many comments. The issues raised included objections to the grouping of sites into geohydrologic settings, requests for detailed explantions of the selection of preferred sites, and doubts about the availability of sufficient information to discriminate between sites in a geohydrologic setting.

Issue

There were objections that the requirement for grouping sites into geohydrologic settings and selecting one preferred site from each setting artificially elevates the importance of host-rock diversity over geologic conditions. It automatically places the Hanford and the Nevada sites in the top five and makes it possible for technically superior sites to be overlooked in favor of sites in different settings.

Response

It is indeed true that the second-best site in one geohydrologic setting may be in some respects superior to the best site in another geohydrologic setting. However, it is not necessary to find the absolutely best site for the repository; a research for the absolutely best site could be almost endless. It is necessary to find and qualify good sites--ones that meet or exceed all of the technical requirements that bear on protecting public health and safety during repository operations and over the long term. In order to find satisfactory sites in a reasonably expeditious manner, and to satisfy the requirement of the Act that sites from different host rocks be recommended, the DOE has chosen to emphasize diversity of geohydrologic settings in the process of selecting sites for nomination and recommendation. Maintaining a

diversity of rock types has the added advantage of minimizing the possibility of a program delay that could be caused by an as-yet-unrecognized basic flaw in a particular host rock.

The fact that the emphasis on geohydrologic diversity automatically places the Hanford and the Nevada (Yucca Mountain) sites in the top five is an artifact of the processes that led to the nine potentially acceptable sites. The searches that yielded the nine potentially acceptable sites were not necessarily identical. Those that took place on DOE-controlled land, ending with the selection of the Hanford and the Yucca Mountain sites, were directed at choosing a single site on Federal land dedicated to nuclear activities. For example, 9 rock types in 15 alternative locations were considered in the site-screening process for the Yucca Mountain site. The site-screening process for the salt sites had not yet narrowed the candidates down to a single site per geohydrologic setting at the time the nine potentially acceptable sites were identified.

Issue

Several commenters recommended that the final EA should state more clearly the importance to site selection of establishing candidates in a variety of geohydrologic settings and that the selection of the preferred site in each geohydrologic setting should be explained in detail, with reference to the siting guidelines.

Response

The importance of maintaining diversity in geohydrologic settings in the siting process is explained in the preceding response.

Section 2.4 of the EAs for the salt sites describes how the preferred site in each geohydrologic setting was chosen, with reference to the siting guidelines.

Issue

Some parties wanted to know why only one tuff and one basalt site were considered as compared to seven salt sites. The Nevada and the Hanford sites were compared with no others in the same geohydrologic setting or in the same host rock.

Response

Because the studies of the Nevada (tuff) and the Hanford (basalt) sites were started on the basis of favorable land use (Federal ownership and dedication to nuclear activities), they were focused on locating a geologically suitable site on a particular Federal reservation. The DOE did not need to progress through regional, area, and location studies--the process that identifies alternative sites at each major screening step.

Issue

Some commenters did not believe that the DOE had sufficient information to discriminate between sites in a geohydrologic setting (between Davis Canyon and Lavender Canyon; among Richton, Cypress Creek, and Vacherie Domes; and between Deaf Smith County and Swisher County).

Response

The basis for selecting the preferred site in a geohydrologic setting is discussed in Section 2.4 of each EA. It is the DOE's position that the information currently available on the different sites is adequate for choosing a preferred site in each setting.

C.3.4 NOMINATION AND RECOMMENDATION OF SITES FOR CHARACTERIZATION

In Chapter 7 of the draft EAs, each of the five sites proposed for nomination (Davis Canyon, Deaf Smith, Hanford, Richton Dome, and Yucca Mountain) was assigned a ranking for each technical guideline. Three quantitative methods were then used to aggregate these rankings. Two of the methods were criticized by the commenters for lacking firm theoretical foundations. The third method--described variously as the utility-estimation, rating, or weighting-summation method--was criticized because its application did not follow the procedures suggested by the professional literature. The methods were briefly described in Section 7.4 of the draft EAs, which also presented the results of their application--the identification of three sites as preferred for nomination. A more detailed discussion of the three methods was given in Appendix B.

In response to these comments, the DOE undertook a more formal application of the utility-estimation method (referred to as the decision-aiding methodology) to provide a more defensible overall comparative evaluation as a basis for determining which three sites appear most favorable for recommendation for characterization. The decision-aiding methodology is intended to provide a framework for systematically accounting for the technical and value judgments required in selecting sites for recommendation. It has been reviewed by the Committee on Waste Management of the National Academy of Sciences.

The various steps of the analysis were conducted by a DOE team consisting of experts in decision analysis, the technical disciplines corresponding to the technical siting guidelines, and repository performance. The technical information for the analysis was obtained from the final EAs. The value judgments were provided by DOE management and staff. A detailed explanation of the decision-aiding methodology, the analyses that were performed, and the results are presented in the multiattribute utility analysis of nominated sites and the recommendation of candidate sites, which are being issued separately.

The rankings reported in Chapter 7 of the draft EAs elicited numerous comments, some of which objected to the rankings assigned for a particular guideline and some of which suggested different rankings. A number of comments were also directed at the methodology used in aggregating the rankings, at the weighting used for the postclosure and the preclosure guidelines, and at the choice of preferred sites.

In the final EAs, Chapter 7 presents only a comparative evaluation of the nominated sites that does not rank the sites on individual guidelines and does not aggregate rankings to identify preferred sites for recommendation. The ranking is performed in the multiattribute utility analysis of the nominated sites. For this reason and because the process of identifying the most favorable sites for recommendation is significantly different from that described in the draft EAs, comments on Chapter 7 and Appendix B of the draft EAs that were specifically concerned with the ranking of sites or the methodology are not addressed here. These include comments on the specific ranking (i.e., criticisms or endorsements) of sites on particular guidelines, aggregate rankings, and the methodology itself. For such comments the issues are summarized, however, to show the concerns of the commenters. The reader interested in the ratings assigned to the sites is referred to the multiattribute utility analysis of the nominated sites and the recommendation of candidate sites. The comments that are addressed here are those that sought clarification about, or commented on, the comparative evaluation of the sites in the draft EAs rather than simply disagreeing or agreeing with a ranking; they include, for example, comments suggesting factors that should have been considered in the evaluation or questioning the use of a particular assumption. These comments were divided into two categories: (1) comparative evaluations against postclosure guidelines and (2) comparative evaluations against preclosure guidelines.

C.3.4.1 Comparison of sites on the basis of postclosure guidelines

Comments on the comparative evaluation of sites against the postclosure guidelines covered each guideline. They included questions about the findings made for particular conditions of the guidelines, comments about the data base, and recommendations for expanding or improving the analysis. As already explained, comments that were specifically concerned with ranking or methodology are not addressed here. Comments about the evaluations of individual sites against the postclosure guidelines are addressed in Section C.5 of the final EA for the particular site.

C.3.4.1.1 System guideline

Issue

A commenter stated that the DOE's failure to compare the sites on the basis of the postclosure system guideline masks the Hanford site's alleged inferior performance in comparison with the other sites.

Response

A comparison of sites against the system guidelines was not performed for the draft EA, because the available data were deemed insufficient for assessing the performance of the total repository.

Both the draft and the final EAs report the results of preliminary performance assessments, but these results were not appropriate for use as the basis for selecting sites for recommendation.

C.3.4.1.2 Geohydrology

The comparative evaluation of the sites against the postclosure guideline on geohydrology elicited many comments. The issues raised included the definition of the accessible environment, the estimates of ground-water travel times and the analyses on which they were based, risk to regional water sources, the comparison of sites in saturated and unsaturated zones, the adequacy of the data base, and criticisms of the findings for specific sites.

Issue

One commenter noted that Chapter 7 of the EAs should be revised to take into account the 2-kilometer distance to the accessible environment rather than 10 kilometers. This would be consistent with draft 5 of the EPA standard.

Response

Analyses in Chapters 6 and 7 have been revised to use a distance of 5 kilometers to the accessible environment. The 5-kilometer distance is consistent with the final EPA standards, which were published in September 1985 (EPA, 1985). (See also Section C.3.1.1 for comments on the definition of the accessible environment in the guidelines.)

Issue

Two commenters felt that the discussion of favorable condition 3, ease of characterizing and modeling, was much too brief. This condition is considered to be not present at all five sites.

Response

The DOE agrees with the comment; the text has been revised to indicate that favorable condition 3 is a major consideration. The discussion has been expanded to more completely discuss uncertainty in characterizing and modeling each of the sites.

Issue

Two commenters asked whether the four subconditions under favorable condition 4 are of equal weight and recommended that ground-water flux be a factor in assessing the sites.

Response

In terms of making a finding on this favorable condition, the four subconditions are of equal weight in that the presence of any one subcondition results in a finding of present. The DOE agrees that ground-water flux should be a factor in assessing the sites and has revised the evaluation of the sites against the geohydrology guideline to explicitly consider it.

Issue

Several commenters were concerned with the uncertainty in ground-water travel times in the comparative evaluations of sites against the geohydrology guideline. One commenter said that the lack of data on the complexity of

ground-water flow paths was not adequately assessed. Another party provided alternative travel-time calculations, including faster travel times than those presented in Chapter 7. A third commenter contended that the approach to ground-water modeling in the draft EA is not conservative and therefore does not compensate for uncertainty in data. One commenter felt that the range of travel times, such as 87,000 to 361,000 years, is large enough to indicate that not enough data are available for an accurate prediction. Another commenter challenged the statement that the dry conditions at Yucca Mountain almost compensate for the shorter travel times in comparison with salt, saying that this conclusion is unsupported, and questioned DOE's ability to ultimately characterize and model this site.

Response

The travel-time analysis has been reviewed and extensively revised in response to various comments. A stochastic analysis has been completed for all five sites, using ranges of key hydrologic parameters to better represent the varying uncertainties in the data base. The DOE agrees that there are not enough data to make accurate predictions of ground-water travel times. However, the DOE considers that the preliminary modeling is sufficient for comparative evaluations of the five sites for the purposes of the EAs. With respect to Yucca Mountain, the DOE has reconsidered the relative ranking of the site to reflect the uncertainties in characterizing and modeling and in the range of travel times when compared with the salt sites. However, the DOE considers that all five sites can ultimately be characterized and modeled with reasonable certainty.

Issue

One commenter questioned whether the four subconditions under favorable condition 4 of the geohydrology guideline are of equal weight. If they are not, then the sites are not being evaluated against this guideline in an equitable manner.

Response

The four subconditions of favorable condition 4 address the components of ground-water travel time and therefore bear on a single parameter. In that respect, the guideline can be viewed as treating each site equitably.

Issue

One comment said that neither Chapter 7 nor Appendix A of the draft EAs discusses the relative risk posed by a repository to various regional water resources, such as the Ogallala aquifer and the Colorado River.

Response

Risk to various regional water resources is considered under the qualifying condition for each postclosure technical guideline: a site will be qualified under each of the postclosure technical guidelines only if the repository will not be likely to lead to radionuclide releases greater than those referenced in the postclosure system guideline. The postclosure system guideline requires compliance with the EPA and NRC regulations for waste

disposal and requires that the geologic setting of a site allow for the physical separation of radioactive waste from the accessible environment in accordance with the specified regulations. The accessible environment by definition includes regional water resources outside the controlled area of the repository. In addition, the guideline on geohydrology includes a potentially adverse condition of the presence of ground-water sources, suitable for crop irrigation or human consumption without treatment, along ground-water flow paths from the host rock to the accessible environment. If this potentially adverse condition is present at a site and is judged to be sufficiently adverse to preclude meeting the qualifying condition, then a site will be disqualified.

Issue

Some parties said that the flow of ground water through salt may not be in accordance with Darcy's law. The process of diffusion and the flow of ground water through fractures in salt may predominate and should be considered.

Response

The question of Darcian flow in salt and the potential for diffusion and flow through fractures are evaluated in the final EAs. The question of ground-water flow through a body of salt has not been resolved at this time and will be addressed during site characterization.

Issue

Many comments said that the calculations of ground-water travel time for the Hanford site are inappropriate. In addition, one party noted that the Basalt Waste Isolation Project had failed to comply with NRC's request in the "Draft Issue-Oriented Site Technical Position (ISTP) for BWIP," Section 1.0, page 6.

Response

Concerns about the analysis of ground-water-travel time for the Hanford site have been reviewed and are addressed in Section C.5.11 of the final EA for the Hanford site. Modifications to the conceptual model, the data base, and the revised calculation of the ground-water-travel time from the repository to the accessible environment 5 miles away have been made in Section 6.4.2.6.1 of the final EA for Hanford. Such an analysis is required to determine whether the first favorable condition and the disqualifying condition for the geohydrology guideline are present.

Compliance with the "Draft Issue-Oriented Site Technical Position for the Basalt Waste Isolation Project" is not in question. The purpose of the document was to identify technical issues that would have to be resolved during site characterization. The Nuclear Regulatory Commission did not request that the issues be resolved before the publication of the final EA.

Issue

One commenter noted that the travel-time discussion for the Hanford site gives the misleading impression that the travel times are based on 50 transmissivity values.

Response

The discussion of travel time has been extensively revised to be consistent with additional analyses completed for the final EA. The point raised by the commenter has been clarified.

Issue

One commenter stated that favorable condition 1 of the geohydrology guideline should not be considered present at the Hanford site. Hanford may be the only site where this condition is not met.

Response

Ground-water-travel times have been extensively reanalyzed for all five sites in response to comments on the draft EAs. For the Hanford site, key hydraulic parameters were conservatively evaluated over appreciable ranges in the stochastic model to account for uncertainty. The results indicate a probability of 0.22 for a travel time of less than 10,000 years. However, the median travel time is less than 34,000 years. Because the median travel time best represents the expected value, it appears that, on the basis of currently available data, this favorable condition can be met. The commenter is referred to Sections C.5.8 and C.5.11 of the final EA for the Hanford site for detailed responses to comments on the analysis of ground-water-travel time and uncertainties in the key hydraulic parameters used in this analysis.

Issue

One commenter argued that, since the ground-water-travel times for the bedded-salt sites in Utah and Texas were attributed to secondary permeability features and this was untrue, favorable condition 1 of the geohydrology guideline is not present at the Utah and the Texas sites.

Response

The appropriateness of including secondary permeability features is evaluated in the final EAs.

Issue

One commenter suggested that the DOE reconsider the rating of the Davis Canyon site under the geohydrology guideline in Chapter 7. Specific findings for Davis Canyon were questioned, with comments including the following:

- Favorable condition 1 should be considered to be not present, because a conservative analysis should include a catastrophic early release to the upper and the lower hydrostratigraphic units. If fracture flow is assumed, the ground-water-travel times within these units could be less than 10,000 years.

- Favorable condition 2 should be considered not present, because the effects of potential dissolution features, such as fault R, were not considered.

- Favorable condition 4 should be considered not present. Credit should not be taken for conditions 4(i) and 4(ii) if the effect of secondary permeability is considered.

- Potentially adverse condition 1 should be reevaluated to take into account the effects of thermal buoyancy or the hydraulic gradient.

- Potentially adverse condition 2 should be reevaluated to consider flow paths upward to overlying units with a total-dissolved-solids content of less than 10,000 ppm.

Response

The DOE has reconsidered the rating of the Davis Canyon site with respect to the geohydrology guideline. The relative ranking of this site with respect to the Richton Dome has been lowered. The specific comments on guideline conditions can be answered as follows:

- Favorable condition 1 is still considered to be present. No mechanism has been identified for a catastrophic early release to the upper and the lower hydrostratigraphic units. Revised travel-time calculations consider unlikely flow paths that might result from fracture zones, although there is no evidence that such zones exist. The revised travel times exceed 10,000 years.

- Favorable condition 2 is also still considered to be present. The revised discussion takes into account the potential for dissolution, including fault R. The stratigraphic offset along fault R is interpreted to be insufficient to be conducive to dissolution. Breccia pipes and other dissolution features are discussed in Chapter 6 of the Davis Canyon EA under the postclosure guideline on dissolution.

- The DOE has reevaluated favorable condition 4 and agrees that condition 4(ii) is not present. However, condition 4(i) is considered present because available data indicate that the host rock and the immediately surrounding units have low hydraulic conductivities. To claim that favorable condition 4 is present, only one of the subconditions needs to be present.

- Potentially adverse condition 1 covers only natural changes in geohydrologic conditions; changes related to repository construction and waste emplacement, such as thermal buoyancy, are evaluated under the postclosure guideline on rock characteristics.

- The revised travel-time analysis does evaluate flow paths upward from the proposed repository host rock because of the potential for localized upward gradients at the Davis Canyon site. The results of this analysis suggest that upward flow paths would reach the accessible environment laterally rather than through overlying units containing ground-water sources with a low total-dissolved-solids content.

Issue

One commenter noted that Davis Canyon has superior geohydrologic conditions when compared with Deaf Smith in terms of the ground-water-travel time and should rank high.

Response

The DOE agrees; the relative ranking on the geohydrology guideline has been revised to show that, with respect to the geohydrology guideline, the Davis Canyon site is preferable to the Deaf Smith site.

Issue

Two commenters suggested that the hydraulic conductivities in the host rock and the surrounding units are low at the Richton Dome; therefore favorable condition 4(i) and hence favorable condition 4 should be considered present at this site.

Response

The DOE agrees that the hydraulic conductivity within the host rock is very low at the Richton Dome. However, the horizontal hydraulic conductivity in the surrounding units ranges from 2.2 to 4.6 x 10^{-6} meter per day (7.2 to 1.5 x 10^{-5} foot per day). This range of horizontal hydraulic conductivities for the surrounding units does not support a finding that condition 4(i) is present.

Issue

One commenter suggested that the ranking of the Richton Dome should be lowered because of the likelihood of radionuclide transport in water and pointed out that, according to Chapter 3 of the draft EA, ground water moves up from the lower to the upper aquifer, providing a mechanism for radionuclide contamination of usable aquifers. Water in the upper aquifer flows toward Richton. There are no data on fluid movement in anomalous zones or within the salt. In addition, consideration should be given to the possible contamination of drinking water during site characterization.

Response

In the final EA for the Richton Dome, the boundary of the accessible environment is considered the edge of the salt dome. Therefore, if the Richton Dome is selected for site characterization, any radionuclide releases to the lower aquifer will have to be demonstrated to be within the limits specified by the EPA standards. In addition, the presence or the absence of anomalous zones and the mechanism of fluid movement within the dome will have to be resolved. Preliminary estimates of fluid movement within the Richton Dome suggest that ground-water travel within the Dome is very slow if it happens at all. Therefore, the DOE considers the Richton Dome to be more favorable than the other four sites with respect to the geohydrology guideline. No contamination of ground water is expected from site characterization; the commenter is referred to Chapter 4 of the final EA for the Richton Dome for a discussion of the possible effects of site characterization.

Issue

One commenter noted that the ground-water-travel times for the Yucca Mountain site in Chapter 7 are inconsistent with the travel time in Chapter 6 of the draft EA for Yucca Mountain. The final EA should contain a consistent value or range of values for travel times.

Response

For the Yucca Mountain site, Chapter 7 of the draft EA cites a minimum ground-water-travel time from the edge of the engineered-barrier system to the accessible environment of 23,000 years, and not 47,000 years as noted in the comment. Estimates of ground-water-travel time for the Yucca Mountain site have, however, been extensively revised for the final EA, and a consistent range of travel times is contained in the final document.

Issue

For Yucca Mountain, one commenter questioned the finding of "present" for favorable condition 2 of the geohydrology guideline, saying that the data on cyclic fluctuations in precipitation and changes in water-table elevation are insufficient to make a positive finding for this condition.

Response

The effects of Quaternary hydrologic processes on the ability of the Yucca Mountain site to isolate waste have been evaluated. These evaluations were based on geologic data, preliminary modeling of a rise in the water table under pluvial conditions, and a preliminary performance assessment. Preliminary modeling of increases in the water table during a full pluvial cycle with a 100-percent increase in precipitation suggests that the water table would experience a 130-meter rise. If pluvial conditions were to recur, significant increases in ground-water flux and decreases in ground-water-travel time could occur. However, a preliminary performance assessment for a repository at Yucca Mountain does not suggest a significant effect on waste isolation.

Issue

One commenter noted that, because of the lack of understanding of the unsaturated zone and the fact that the DOE concludes that the knowledge of the waste-isolation capability of Yucca Mountain is uncertain, it is unrealistic to compare a site in the unsaturated zone (Yucca Mountain) with four sites in saturated zones.

Response

The DOE acknowledges the lack of understanding of the unsaturated zone at Yucca Mountain. However, there are also uncertainties in the characterization and modeling of the four sites in saturated zones. For example, the mechanism of ground-water flow in salt is uncertain, the role of fracture flow at the bedded-salt sites is uncertain, and the magnitude of vertical conductivity at the basalt site has not been quantified. The DOE has not concluded that the waste-isolation capability of Yucca Mountain is uncertain; on the contrary, it

expects that the uncertainties in the data base and in the preliminary modeling of the unsaturated zone can be resolved with reasonable assurance during site characterization. The DOE does not consider that a comparison of a site in the unsaturated zone at Yucca Mountain with four sites in the saturated zone is unrealistic.

Issue

One commenter noted that the data base used for the comparative evaluation of Yucca Mountain against the geohydrology guideline consists of two wells in the unsaturated zone and 30 wells in the saturated zone. Additional data from the unsaturated zone are required to base conclusions about geohydrology; data should not be extrapolated from the saturated zone to the unsaturated zone.

Response

The DOE agrees that additional data from the unsaturated zone will be required if the Yucca Mountain site is selected for characterization. However, the preliminary data from the unsaturated zone at Yucca Mountain are considered sufficient for comparative evaluations of sites against the guidelines. The site-specific data base for Yucca Mountain is, in fact, more extensive than the data base for the three salt sites.

Issue

One commenter asked why, in the discussion of favorable condition 2, which is related to hydrologic processes during the Quaternary Period, cyclic fluctuations in precipitation were considered only for the Yucca Mountain site.

Response

The discussion of cyclic fluctuations in precipitation during the Quaternary is emphasized for Yucca Mountain because increased precipitation affects flow through the unsaturated zone and the elevation of the water table, and therefore favorable condition 2 is not present at Yucca Mountain. As stated in the text, similar processes have been evaluated for the other sites, but the effects of these processes are not likely to adversely affect waste isolation; therefore, the favorable condition is present at the other four sites. The text of the final EAs has been revised to discuss Quaternary hydrologic processes at each of the sites in greater detail.

Issue

One commenter recommended that the discussion of ground-water-travel time at Yucca Mountain, specifically travel through the Calico Hills nonwelded tuff unit, be clarified.

Response

The suggestion was accepted, and the discussion has been clarified.

C.3.4.1.3 Geochemistry

The comments about the comparative evaluation of sites against the geochemistry guideline covered inconsistencies in the discussion of geochemical conditions in Chapters 6 and 7 of the EAs, disparities in the data available for the various host rocks, and specific suggestions for the findings made for particular sites.

Issue

One commenter was concerned with disparities in the comparison of the sites with respect to the availability of data and the types of data for the geochemistry guideline. Favorable conditions 1 through 4 compare sites on the basis of various conditions that lead to a common result (i.e., isolation). It is not understood how distinct properties like oxidation-reduction conditions and sorptive properties can be equated, especially in light of differing uncertainties.

Response

Uncertainties in the geochemistry of all sites are admittedly present, and the geochemical data base for the sites varies with respect to the types as well as the amount of data. The definitive data for each site will be collected during site characterization. However, the data that are available are adequate for the purposes of the EAs. Geochemical data have been collectively evaluated in the preliminary performance assessments reported in Chapter 6 as the data relate to radionuclide solubility and retardation with respect to EPA standards (EPA, 1985) and NRC criteria (NRC, 1983).

Issue

A commenter criticized the DOE for its subjective treatment of available data to arrive at subjective conclusions as to which site is better than the other. Statistical procedures were then applied to the DOE's "subjectively determined data (rankings under each guideline)" to arrive at the best of five sites. The commenter also felt that the "subjective" conclusions were compounded by the ranking method.

Response

The DOE used the available data from each site, which includes site-specific data as well as regional data, plus professional judgment in order to perform a comparative evaluation of the sites against the guidelines. As already mentioned, the shortcomings of the ranking method used in the draft EA have been corrected.

Issue

The reviewer states that a major shortcoming with the draft EA for the Hanford site is that major concerns are evaluated "with short-term projections." Thus, the EA does not address the long-term problems that are posed by long-lived radionuclides (i.e., thousands of years).

Response

It is assumed that "major concerns" include waste-package lifetime, ground-water-travel time, and radionuclide release rate and retardation. Contrary to the impression of the reviewer, each of these concerns has been evaluated with respect to long-term waste containment and waste isolation. For example, the mean lifetime of the waste-package container is expected to be approximately 6,100 years ± 600 years on the basis of the corrosion rate.

Issue

One commenter said that the Hanford site does not have the advantages of salt. Salt provides excellent radiation shielding, is chemically active with regard to radiation-generated products, and has a higher thermal conductivity than basalt.

Response

Basalt and the associated ground water have significant advantages over salt (e.g., low oxidation-reduction potential, high sorptive capacity). It is true that salt and brine are chemically active when exposed to radiation; however, this reactivity makes salt somewhat less desirable than basalt. For example, gamma and alpha radiations produce more oxidizing products (from radiolysis) in a brine than in fresh water. In addition, rock salt is a poor sorbant for radionuclides. While it is true that salt has a higher thermal conductivity than basalt, the presence of water in the repository at Hanford would aid in the transfer of heat from the area.

Issue

One commenter felt that the salt sites should not be assigned a finding of "not present" for favorable condition 5 solely on the basis of data inadequacy. This party also questioned why such data needs were not investigated in the site-screening process that led to the identification of potentially acceptable sites.

Response

The mineralogic and chemical properties of salt deposits and the associated ground water are not conducive to the physical and chemical retardation of radionuclides (e.g., rock salt has poor sorption properties and brine further inhibits sorptive processes). On this basis, it was deemed conservative to assign the finding of "not present" for favorable condition 5.

Issue

One commenter noted that, even though high salinity inhibits the formation of colloids and particulates, the discussion for the Deaf Smith site suggests that all aquifers at the site contain saline water. It was noted that the upper aquifers contain fresh water.

Response

The discussion has been corrected in the final EA.

Issue

One commenter noted that the Deaf Smith site has no known radionuclide-sorbing minerals.

Response

Little work has been done on the mineral composition of the rock formulations at the Deaf Smith site. Preliminary work by the Texas Bureau of Economic Geology has shown that clay minerals may be present in the muds and mudstone interbeds of the Unit 4 halite of the San Andres Formation. However, because of the preliminary nature of this work, no credit is taken for sorption at the Deaf Smith site. This is noted in the final EA.

Issue

A commenter said that the Richton Dome site should be ranked lower than the Deaf Smith and the Davis Canyon sites for geochemistry because the "accessible environment" is defined as the edge of the salt stock and does not include adjacent aquifers and their retardation properties. Credit for the travel of radionuclides through the adjacent aquifers is irrelevant to the evaluation of the site.

Response

Because of the paucity of data for all of the salt sites, no credit is taken at present for the retardation characteristics of adjacent aquifers at any of these sites. While it is expected that additional retardation of radionuclides within these aquifers will take place, it is not possible to estimate the significance of such retardation effects without site-specific data. Thus, for the sake of conservatism, no credit for retardation in adjacent aquifers has been taken for any of the salt sites.

Issue

One reviewer noted that the radionuclide-complexing effects of carbonate are described in Chapter 7, mentioned only in passing in Chapter 3, and not mentioned at all in Chapter 6.

Response

A more balanced discussion of carbonate now appears in all three chapters.

Issue

One reviewer felt that the presence of carnallite, organic matter, and hydrocarbons at the Davis Canyon site and their absence at the Deaf Smith site should result in Davis Canyon being ranked lower than, or at least equal to, Deaf Smith.

Response

In the final EA, the Davis Canyon and the Deaf Smith sites are considered to have approximately equal geochemical properties. The uncertainties regarding organic materials (including hydrocarbons) are great because of the

paucity of data for both sites. The available data indicate that carnallite may not be a problem at the Davis Canyon site because the carnallite-bearing zone apparently thins in the direction of Davis Canyon; however, this is also uncertain. Potential problems at the Deaf Smith site include the presence of mudstone interbeds and intercrystalline muds that contain clay minerals. Both carnallite and the muds and mudstone interbeds may provide high-magnesium brines during the lifetime of the repository.

Issue

A commenter expressed concern that a statement in Chapter 7 to the effect that the clays at the Swisher and the Deaf Smith sites would "strongly enhance" the sorption of radionuclides is not supported by the discussion in Chapter 6.

Response

In Chapter 7 of the final EAs no credit is taken for the sorptive properties of clays at either the Swisher or the Deaf Smith site.

Issue

One commenter noted that, in regard to favorable condition 2 of the geocemistry guidelines, Chapters 6 and 7 state that "brines will tend to promote the agglomeration of some types of colloids" and that the highly saline ground waters at the Richton Dome will inhibit the formation of colloids. On the basis of the evaluation in the draft EA, it cannot be unequivocally claimed that the evidence supports a favorable finding for this condition.

Response

It should be noted that favorable condition 2 covers a number of geochemical mechanisms, one of which is the formation of colloids. The final EA states that too little is known about particulates, colloids, and organics at each site to evaluate them at this time; favorable condition 1 is evaluated on the basis of other, and better-known, geochemical mechanisms.

Issue

A commenter pointed out that the Richton Dome is ranked lower than the bedded-salt sites, partly because the ground water at Richton is "less reducing than that of the bedded salt sites." The commenter claimed that the data do not support this statement.

Response

This discussion has been modified in the final EA. All three salt sites are now considered to be equal in terms of geochemical conditions, partly because of the paucity of data.

Issue

Some commenters noted that potentially adverse condition 3 of the geochemistry guideline (oxidizing conditions) is present at Yucca Mountain but was not considered in the overall evaluation of the five sites in Chapter 7.

Response

This omission is acknowledged. Potentially adverse condition 3, which is present only at Yucca Mountain, has been considered in the evaluation of the five sites in the final EA.

Issue

One reviewer suggested that, because the Yucca Mountain site is in the unsaturated zone and is not expected to become saturated with infiltrating surface water, the presence of oxidizing conditions (potentially adverse condition 3) is irrelevant. The lack of ground water in the Topopah Springs Member of the Paintbrush Tuff suggests that this condition does not apply to this site.

Response

This condition does apply because ground water, as defined in the guidelines, includes the water in the unsaturated zone whether transient or trapped in pore spaces.

Issue

A commenter noted that a statement in Chapter 7 indicates that no heat-induced alteration of zeolites in tuff at Yucca Mountain is expected. This is inconsistent with Chapter 6, which states that heulandite and smectite may be adversely affected by the heat emitted from the waste emplaced in the repository.

Response

This inconsistency has been corrected in the final EA.

C.3.4.1.4 Rock characteristics

Issue

Two commenters disagreed that "phenomena that could affect isolation... are not expected to have significant effects at any of the sites," as stated on page 7-27 of the draft EAs. One of them said that this statement revealed the DOE's intention of not using certain guidelines.

Response

The cited statement was poorly worded. It should have read "phenomena that could affect isolation...are not expected to produce effects exceeding regulatory limits at any of the sites." As can be seen from Chapters 6 and 7

of the draft and final EAs, each site was evaluated against every technical guideline, and every technical guideline was used in the comparative evaluation of sites.

Issue

One commenter felt that the summary section did not give a detailed explanation of the expected effects of brine migration at each site.

Response

Brine migration is discussed in Section 6.3.1.3.6 of each EA.

Issue

One commenter felt that on favorable condition 2 for postclosure rock characteristics all sites could be given a finding of "present," but should not be considered equal. The commenter felt that the salt sites should be given a higher rating because more of the three conditions specified--high thermal conductivity, low coefficient of thermal expansion, and sufficient ductility to seal fractures--have been demonstrated in salt.

Response

In the final evaluation of sites for recommendation for site characterization, the postclosure guideline on rock characteristics--including the cited favorable condition--is only one of the three guidelines grouped together in a major consideration that examines the effects of repository-induced heat.

Issue

One commenter asked whether rock porosity has been adequately measured.

Response

Since the largest specimens sampled to date are the cores from exploratory drilling, this is the size of specimens on which porosity has been measured. Larger-scale measurements of porosity can be made indirectly by geophysical logging techniques. Larger-scale measurements of porosity will be made during site characterization.

Issue

One commenter requested that the differences between the expected performance of the saturated and the unsaturated zones be mentioned in the discussion of postclosure rock characteristics in the EA for the Hanford site.

Response

The DOE recognizes that there are distinct and different advantages to each of these emplacement conditions. Since the candidate horizon at the Hanford site is in the saturated zone, it is inappropriate to describe the advantages of the unsaturated zone in the EA for the Hanford site.

Issue

One commenter requested that the magnitude of the thermal pulse be discussed in the EAs, to evaluate its significance for the postclosure guidelines.

Response

The effects of heat are described in Sections 6.3.1.3.4, 6.3.1.3.6, and 6.3.1.3.7 of the EAs. Not all the expected effects of heat are discussed in a particular section.

Issue

One commenter asked whether fractures can be thermally induced.

Response

Fractures can be thermally induced, but fractures have not been observed to be sizable under dry conditions. Thermally induced fractures usually occur from rapid increases or decreases in the heat content of a rock or through heat loadings that would be far more severe than those of a repository. Additional data on the potential effects of thermally induced fracturing on repository performance will be gathered during site characterization.

Issue

One party felt that, according to the results in Table 7-17, the basalt site (Hanford) should be ranked higher than the Deaf Smith site.

Response

In regard to Table 7-17 of the draft EAs, the commenter is correct.

Issue

A commenter disagreed with the finding for the Hanford site of "not present" for potentially adverse condition 2 of the rock-characteristics guideline, saying that "the potential for thermally induced fracturing and for the dehydration of fracture (infilling) material is present at the Hanford site, though it may occur only in areas near individual waste packages."

Response

The reasoning behind the finding of "not present" for potentially adverse condition 2 for this guideline is given in Section 6.3.1.3.6 of the final EA for the Hanford site.

Issue

One commenter questioned the basis for the statement that potential stability problems would not affect the containment and isolation capability of the Hanford site.

Response

At the Hanford site, all excavations would be backfilled before closure, but there would be some limits to the degree of rock adjustment that can take place. The Hanford site is not initially taking credit for the containment capability of the host rock and intends to demonstrate that the site performs acceptably without taking credit for travel through the dense interior.

Issue

One commenter felt that the evaluation of the Richton Dome site against the postclosure guideline on rock characteristics should consider the presence of anomalous zones.

Response

The DOE acknowledges this concern and has expanded Sections 6.3.3.2.1 and 6.3.1.3.2 in the final EA for the Richton Dome to discuss this topic.

Issue

One commenter asked why the Davis Canyon and the Deaf Smith sites were ranked close together on postclosure rock characteristics when the discussion for the preclosure guideline on rock characteristics indicates more-substantial differences between the sites.

Response

The term "flexibility" is considered to have a different meaning in the preclosure and the postclosure guidelines. Before closure, the DOE is concerned about whether a repository can be constructed. For the postclosure period, the DOE is concerned about how well the host rock (and other components) will isolate the waste from the accessible environment. Thus, the flexibility portions of the two guidelines are not equivalent. The preclosure and the postclosure evaluations are consistent with the intent of each guideline.

Issue

One commenter felt that insufficient credit has been given to the Davis Canyon site for the higher rock strength that results from a lack of clay insolubles in the host rock.

Response

Because of the lack of data from boreholes, rock strength at the Davis Canyon site is associated with a high uncertainty. Salt in general is a low-strength rock and is described as such in Section 6.3.1.3 of the EA for Davis Canyon. To claim an advantage for the Davis Canyon site at this time is not considered conservative.

Issue

One commenter stated that at the Davis Canyon site the carnallite contained in the rock salt would melt at repository operating temperatures, producing corrosive brine and volume changes.

Response

The corrosive effects of carnallite are discussed in Section 3.2.7 of the EA for Davis Canyon. The volume percentage of carnallite is small, and the effect of melting such a small volumetric fraction is not considered significant at present.

Issue

One commenter was concerned that at the Davis Canyon site the repository horizon would be the uppermost salt bed (salt cycle 6), and hence the salt barriers to the upward migration of radionuclides would be minimal.

Response

The significant Pennsylvanian and Permian strata overlying the host rock would provide an adequate barrier. Furthermore, the hydrologic gradients at the site are predominantly downward.

Issue

One comment about the Davis Canyon site said that thermal uplift will cause fracturing in the upper 625 feet of the overburden above the site, including extensive portions of the Cedar Mesa and the Elephant Canyon Formations, both of which supply water to wells and springs in the Canyonlands National Park.

Response

Thermal uplift has been calculated to provide a maximum lift of approximately 1 meter. Thermal dispersion would probably prevent this uplift from seriously displacing strata and interrupting aquifer continuity.

Issue

One commenter felt that the Yucca Mountain site should be ranked more highly on postclosure rock characteristics than the Deaf Smith site because Yucca Mountain appears to be more favorable in Table 7-3.

Response

The principal reason for this apparent discrepancy is explained in the fourth paragraph on page 7-27 of the draft EAs.

C.3.4.1.5 Climatic change

Issue

One reviewer questioned whether it is worth worrying about an increased precipitation and runoff in the next 10,000 years and the potential for perched water that might intersect the repository shaft.

Response

The DOE agrees. Such a scenario does not appear in the final EA.

Issue

A reviewer said that the Hanford site should be ranked lowest on the climatic-change guideline because of the potential for catastrophic flooding and lakes, as evidenced by recent catastrophic flooding.

Response

The Hanford site would not be affected by catastrophic flooding after repository closure because such flooding occurs on the surface and the shafts and boreholes would be sealed.

Issue

The reviewer inquired as to whether changes in surface-water conditions at the salt sites could increase salt dissolution and why these changes were not considered.

Response

This question is addressed in Section 6.3.1.4.2 of the draft and the final EAs for the salt sites.

Issue

One party noted that, in the climatic-change guideline, the conclusion for potentially adverse condition 1 for the Deaf Smith site is based on available data for the Quaternary Period. Yet the discussion on favorable condition 2 states that data for the Deaf Smith site are insufficient to determine the effects of changes on the hydrologic system.

Response

Potentially adverse condition 1 and favorable condition 2 are quite different. The latter states that climate changes have had little effect on the hydrologic system, whereas the potentially adverse condition states that climate changes could affect the ground-water flow system to significantly increase the transport of radionuclides to the accessible environment. Thus, the available data are adequate to address one, but not the other, condition.

Issue

One comment pointed out that an increase in the recharge and discharge of aquifers may not alter permeability within a salt sequence but might increase salt dissolution at the salt-rock interface and salt margins.

Response

While dissolution in these areas may be increased during times of increased recharge and discharge, the calculated rates of dissolution are conservative to account for any additional dissolution that may result from the increased availability of water.

Issue

The sites are ranked equally with respect to climatic change, yet Table 7-4 seems to rank Yucca Mountain slightly better than the other sites.

Response

In Table 7-4 of the draft EAs the Yucca Mountain site shows "not present" for a potentially adverse condition related to a potential rise in the water table. This applies only to Yucca Mountain; the other sites are below the unsaturated zone.

C.3.4.1.6 Erosion

A number of commenters expressed concern that the DOE has not adequately considered all information in the comparative evaluation of the sites against the guideline on erosion. The issues raised include changes in the ranking of sites, the relative importance of the potentially adverse and favorable conditions, and specific comments on erosion at Yucca Mountain and Hanford.

Issue

One commenter proposed that all sites except Yucca Mountain be ranked equal on the erosion guideline; Yucca Mountain should have a lower ranking because the repository would be closer to the surface.

Response

As stated in the draft EA, the objective of the erosion guideline is to ensure that erosional process acting on the surface will not be likely to lead to radionuclide releases greater than those allowed by regulations. The ranking evaluations in the draft EA were based on the qualifying, favorable, and potentially adverse conditions as they influence this objective.

Issue

One party argued that the favorable and potentially adverse condition for the erosion guideline are not of equal importance and should not be treated as equal.

Response

The DOE agrees. The qualifying condition relates to the requirements of 40 CFR Part 191, as implemented by the provisions of 40 CFR Part 60, and therefore the second favorable condition, if it is present, is the most significant because, according to 40 CFR Part 191, events with less than one chance in 10,000 over 10,000 years need not be considered in assessing postclosure performance. In general, if favorable condition 2 is present at a site, favorable condition 3 also is likely to be present and both potentially adverse conditions are likely to be absent. Because favorable condition 2 is present at all sites, all sites are rated equal with respect to the qualifying condition.

Issue

For the Hanford site, questions were raised regarding the proposed depth of the repository versus favorable condition 1 and the erosion depth from regional base levels discussed in favorable condition 2.

Response

Favorable condition 1 does not limit the depth of a repository; it merely says that ability to emplace waste at least 300 meters below the surface is favorable. The regional base levels in the draft and final EA for Hanford should be considered as bounding estimates, not as best estimates. Even under bounding estimates, Hanford was found to have favorable condition 2 and thus is rated the same as the other sites.

Issue

One commenter expressed concern that the evaluation of Yucca Mountain did not fully take into account portions of the repository whose depth is less than 300 meters.

Response

As reported in the draft and the final EA for Yucca Mountain, the minimum thickness of the overburden above the underground facility is about 230 meters, at the western edge of the primary area. However, for about 50 percent of Yucca Mountain the overburden is more than 300 meters thick. Because all of the repository would be at a depth greater than 200 meters, the site would not be disqualified. As stated in the draft EA, the fact that Yucca Mountain does not possess favorable condition 1 (waste emplacement below 300 meters) does not appear significant, because an evaluation of erosion rates for Yucca Mountain, applied to the 230-meter minimum depth, indicates that erosion would not significantly affect waste isolation over the next 10,000 years.

C.3.4.1.7 Dissolution

Issue

One reviewer felt that the draft EA did not consistently treat the favorable and the potentially adverse condition under dissolution for the three salt sites.

Response

The dissolution section in the final EAs has been revised to present a more consistent discussion of the two conditions for the salt sites.

Issue

One commenter objected to the statement that no significant dissolution has been identified at the Deaf Smith site because the statement is based on data from a well 3 miles from the site and seismic-reflection data that do not "cover" the site.

Response

While the available data from the area of the site do not unequivocally show that there is no dissolution at or near the site, data from boreholes, seismic-reflection measurements, as well as surface mapping have uncovered no evidence that significant dissolution occurred beneath the Southern Highlands at any time during the Quaternary Period.

Issue

One reviewer asked why the Pennsylvanian faults that occur 7 miles from the Davis Canyon site were not mentioned in the discussion on dissolution and whether the rates at which dissolution fronts are migrating could increase with the predicted increase in precipitation.

Response

The faults described by the reviewer die out in the lower part of the Paradox Formation; these faults have no surface expression. In addition, no indication of dissolution has been observed to be associated with these faults. In regard to the second question, no dissolution fronts have been identified in the study area. Discrete dissolution features like Lockhart Basin and Beef Basin may be affected by an increase in precipitation; however, the current rate of dissolution is not known.

Issue

One commenter objected to Yucca Mountain's receiving a finding of "not present" for the potentially adverse condition under the dissolution guideline. The repository would be near the breccia of the Solitario Canyon fault zone, which the draft EA does not discount as a dissolution phenomenon. Therefore, unless sufficient data are available to show that the fault is not related to caldera collapse, it should be assumed that the fault is a dissolution feature and the Yucca Mountain site should be considered as having this potentially adverse condition.

Response

The solubility of tuff in ground water is extremely low; furthermore, the hypothesis that the Solitario Canyon fault is a dissolution feature is not credible. Any breccia associated with the fault zone is of tectonic origin, and there is no logical reason to believe that the fault is the result of dissolution.

C.3.4.1.8 Tectonics

A number of commenters expressed concern that the DOE did not adequately consider all information in determining numerical ratings for the postclosure guideline on tectonics. Among the issues raised were the treatment of preexisting faults at the Deaf Smith site, the potential for diapirism in general and salt movement at the Gibson Dome as it relates to Davis Canyon, and the level of tectonic activity at the Yucca Mountain site.

Issue

One commenter wanted to know how preexisting faults at the Deaf Smith site were treated in the comparative evaluation against the postclosure guideline on tectonics.

Response

The evaluation of tectonic and igneous events is based on our understanding of those processes during the Quaternary Period. Faults that have been active during the Quaternary are more likely than older faults to be active now and for the next 10,000 years. The Deaf Smith site is different from the Davis Canyon site because Quaternary faults have been identified near Davis Canyon but not near Deaf Smith. Thus, Deaf Smith is more favorable with respect to Quaternary faults.

Issue

Some commenters asked why diapirism was not discussed in the comparative evaluation of sites, citing the Gibson Dome in Utah as a structure in which salt movement continues today.

Response

Potentially adverse condition 1 of the postclosure tectonics guideline is based on evidence of active tectonic processes, including diapirism. Although not explicitly discussed in Chapter 7, diapirism was evaluated in the draft EAs for the salt sites. As explained in Chapter 6 of the EAs, there is evidence that diapirism has not been active at any of the three salt sites during the Quaternary Period.

In regard to the Gibson Dome, the final EA for Davis Canyon explains that some degree of salt flow has occurred within the evaporite units near the Davis Canyon site, but the area of the site generally contains relatively undisturbed bedded salt.

Issue

Several comments pertained to the level of tectonic activity at the Yucca Mountain site and the treatment of tectonics in site evaluation.

Response

The evaluation of sites against the postclosure guideline on tectonics is primarily concerned with the effects of tectonic events on waste containment and isolation. As stated in the draft EA, the available data do not suggest that tectonic events at Yucca Mountain, Davis Canyon, and Hanford could both alter the hydrologic flow system and lead to radionuclide releases after repository closure. An accurate evaluation against the postclosure guideline on tectonics includes not only an assessment of the probabilities of events but also an assessment of whether an event could adversely affect the repository system.

In the final EA for the Yucca Mountain site, the discussion of repository performance has been expanded in Chapter 6 because the tectonic activity warrants additional discussion. The revised discussion adds perspective to issues on postclosure tectonics. It includes such factors as ground-water flux and travel time, waste-package integrity, the careful consideration during repository development of recognizable faults that appear to have any possibility of movement, and the geochemical capabilities of the site. While many studies remain to be completed, particularly with respect to probabilities, preliminary assessments of system performance suggest that tectonic events are not likely to lead to radionuclide releases in excess of regulatory limits.

Issue

One commenter argued that the DOE failed to identify or evaluate the seismic risk at Yucca Mountain (as shown in a map of seismic risk produced by the U.S. Geological Survey). The map clearly shows that Yucca Mountain is in a region of major seismic risk. The seismic risk in this region is much higher, in fact, than that at any of the other sites.

Response

The draft EAs recognize that the tectonic hazard at the Yucca Mountain site is higher than that for the other sites (page 7-116). Both the postclosure and the preclosure rankings (pages 7-44 and 7-115) reflect this relative comparison.

If the Yucca Mountain site is selected for characterization, site-specific estimates of seismic hazards will be made during characterization. In parallel with this, each site will be evaluated for the significance of tectonic hazards with respect to the total risk.

C.3.4.1.9 Natural resources

A number of commenters expressed concern that the DOE did not adequately consider all information in ranking the sites for the postclosure guideline on natural resources. The issues raised include the evaluation of future resources and the use of artificial markers as well as specific comments on resources at Deaf Smith, Davis Canyon, Hanford, and Yucca Mountain.

Issue

One commenter pointed out that the resources of today may not be the resources people will seek in the distant future.

Response

The evaluation of natural resources has been based on "reasonable projections of value, scarcity, and technology," as stated in the qualifying condition of the guideline. This statement is meant to reflect the NRC's 10 CFR Part 60, which states that the evaluation of the resource potential should consider whether economic extraction is currently feasible or potentially feasible during the foreseeable future. Thus the goal of natural-resource assessment is to ensure an acceptably low likelihood of postclosure human activities that would be detrimental to waste containment or isolation. This does not mean that the future development of a "new" resource can be absolutely ruled out, but, on the basis of our present understanding, this potential can be minimized. Furthermore, it is expected that permanent markers and records will also reduce the potential for human interference at the repository site.

Issue

One party commented that Chapter 7 of the draft EAs contained no more than a passing mention of artificial markers and asked whether there are any site-specific factors affecting the use of such markers.

Response

As stated in the qualifying condition for the postclosure guideline on natural resources, in assessing the likelihood of postclosure intrusion, the DOE will consider the estimated effectiveness of permanent markers and records. In evaluating the sites against the guidelines, the EAs qualitatively considered the effectiveness of markers and records in reducing the likelihood of human intrusion within the controlled area.

Issue

One party said that the Hanford site has a potential for ground-water resources and natural gas and should be disqualified for that reason.

Response

As discussed in the final EA for the Hanford site, the finding for potentially adverse condition 1 has been changed from "not present" to "present" because of the potential uses of ground-water resources and

natural gas. It should be noted, however, that although source beds (for hydrocarbons) may exist beneath the basalt, present exploration activity has not found adequate evidence of significant concentrations of any mineral or rock that is unique to the Hanford site. The geothermal potential of the site is considered nonfavorable. The revised evaluation of the Hanford site is based on the latest information on the potential for hydrocarbon and other resources. As the potential for resource extraction is by nature speculative and the use of permanent markers and records will assist in reducing the likelihood of human intrusion within the controlled area to very low values, the Hanford site should not be disqualified because of the potential for natural resources.

Issue

One commenter suggested that the EA for Davis Canyon evaluate ground water and the Colorado River as valuable natural resources. Another commenter noted that, although Chapter 7 suggests that only minor aquifers exist above the host rock at Davis Canyon, the Cedar Mesa sandstone aquifer, which overlies the host rock, is used as a water supply for the Canyonlands National Park.

Resources

As discussed in the final EA for Davis Canyon, ground-water use in the area and vicinity of the site is minimal. Existing wells yield small quantities of ground water from the Glen Canyon Group as well as the Cedar Mesa and Cutler strata; however, these wells are less than 400 feet deep. As such, ground water is not expected to have an adverse effect on the ground-water flow system. Section 3.3.1.5 of the final EA discusses water availability and demand, including the amounts of water available from the Colorado River in a Davis Canyon region. Because the Colorado River is too far for its use to be practical, it was not considered significant as a potential resource that would directly affect the Davis Canyon site.

The commenter is correct in noting that the Cedar Mesa sandstone aquifer supplies water for Canyonlands; however, this aquifer is not highly productive at the Davis Canyon site. As summarized in Chapter 3 of the draft EA, this aquifer produced only a few gallons per minute from its entire thickness at well GD-1.

Issue

One party questioned the assessment of natural resources at Yucca Mountain, saying that the mineral potential had been ineffectually evaluated.

Response

As discussed in the final EA for the Yucca Mountain site, there are no energy or mineral resources for which economic extraction is feasible in the foreseeable future. The DOE does not agree that the mineral potential of the site has been ineffectually evaluated. The evaluation is based on a review

of the literature, exploration and geologic mapping by the U.S. Geological Survey, and geochemical analyses of cores and cuttings taken from boreholes at and near Yucca Mountain.

C.3.4.1.10 Site ownership and control

Issue

The draft EA states that there is no basis for distinguishing among the sites in terms of site ownership and control at the beginning of the postclosure period, and therefore all sites were ranked equally on this guideline. One commenter asked why, if this is correct, land ownership is one of the guidelines.

Response

The postclosure guideline on site ownership and control is included in the siting guidelines to ensure consistency with the portion of NRC regulations in 10 CFR Part 60 that addresses the long-term control of the site by the DOE (10 CFR 60.121). In addition, this postclosure guideline is distinguished from the preclosure guideline on site ownership and control in two ways. First, the favorable condition for the preclosure guideline refers to the control of "...all surface and subsurface mineral and water rights by the DOE," whereas the favorable condition for the postclosure guideline refers to the "control of land and all surface and subsurface rights by the DOE." Second, the preclosure guideline is directed at the DOE's ability to control access to the site during repository operation, under the requirements of the system guideline for radiological safety. The postclosure guideline, in contrast, is a part of the human-interference guideline (960.4-2-8), which is intended to ensure that future generations will not compromise the integrity of the repository. Thus, although the DOE does not believe that there is currently a basis for discriminating among sites on the basis of postclosure site ownership and control, the guideline serves a necessary function in the siting process.

C.3.4.2 Comparison of sites on the basis of preclosure guidelines

The preclosure guidelines are divided into three groups, in order of decreasing importance: (1) preclosure radiological safety; (2) socioeconomics, environment, and transportation; and (3) ease and cost of siting, construction, operation, and closure. The issues raised in comments on the evaluation of the sites against these guidelines are summarized and addressed in this section.

C.3.4.2.1 Preclosure radiological safety

The preclosure guidelines on radiological safety consist of four separate guidelines: (1) population density and distribution, (2) site ownership and control, (3) meteorology, and (4) offsite installations and operations.

C.3.4.2.1.1 Population density and distribution

Issue

Many commenters stated that the evaluation of the Hanford site against the guideline on population density and distribution did not take into account the approximately 12,000 workers that the DOE and its contractors currently employ at the Hanford Site or the 3,500 of these 12,000 workers who work in the vicinity of the potential repository site. These commenters stated that the objective of the guideline is to protect the health and safety of both the public and repository workers and that the evaluation presented in the draft EA ignored the safety of the Hanford workers. Several of these commenters said that it is ridiculous to argue that the 3,500 Hanford workers in the vicinity of the site are "not members of the general public" as the draft EA states on page 7-57. Others insisted that the presence of these Hanford workers constitutes a high daytime population density for the site.

Response

The DOE agrees that the 3,500 Hanford workers must be considered members of the general public for the purposes of this evaluation. However, these persons work in the general vicinity of the site and not, as the guideline condition stipulates, "within the projected site boundaries."

Issue

One commenter noted that the draft EA reported the population density for the Hanford site as 43 persons per square mile and for the Richton Dome site as 40 persons per square mile, but nonetheless the Hanford site received a much higher score on this guideline than did the Richton Dome.

Response

The guideline on population density and distribution requires the DOE to evaluate the remoteness of the site from highly populated areas in addition to the population density of the general region of the site. While the population density is similar for both sites, the controlled area of a repository at the Richton Dome site would be adjacent to the town of Richton.

Issue

A few commenters stated that the evaluations of sites against the first favorable condition of the guideline on population density and distribution should consider transient populations. These commenters suggested that this condition might affect the population density given for the Davis Canyon site.

Response

Transient populations are explicitly considered by the first potentially adverse condition, which addresses high residential, seasonal, or daytime population densities within the projected site boundaries. Chapter 7 of the final EA also addresses such transient populations as users of offroad vehicles. These considerations do not significantly affect the population density for the Davis Canyon site.

C.3.4.2.1.7 Site ownership and control

Issue

Many commenters stated that the ranking of the Yucca Mountain and the Davis Canyon sites--both of which are on land owned by the Federal Government-- below the Richton Dome and Deaf Smith sites is indefensible and highly artificial. They insisted that to transfer land belonging to the Federal Government is easier than obtaining private land. One person said that persons who face the loss of their property will go through every legal means possible to keep their land. Another pointed out that the acquisition of private land is time consuming and expensive and that affected landowners have testified that they will not enter into voluntary leases or purchase-sell agreements; this commenter claimed that even identifying all of the affected owners of surface and subsurface rights will take time, given the large number of owners involved.

Two commenters noted that the Congressional action described as necessary in the draft EA for the Yucca Mountain and Davis Canyon sites would not be necessary until the time, or after, Congress approves the site for a repository, pursuant to Section 115 of the Act. They felt that it was ridiculous to argue that Congress would override a State veto of a site selection and then fail to expeditiously transfer land title to the DOE. All of these commenters therefore recommended ranking the Yucca Mountain and the Davis Canyon sites above the Richton Dome and the Deaf Smith sites because they believe that the transfer of land between Federal agencies is easier than obtaining private land.

One commenter stated that to obtain land at the Richton Dome site would create major, negative, and highly disruptive impacts for innocent citizens and that these impacts could be avoided at either the Yucca Mountain or the Davis Canyon site. Another party suggested that the Richton Dome site should be ranked below the Deaf Smith site because the privately owned land at Deaf Smith is agricultural land, of which there is no shortage.

Response

The guideline addresses only the complexity of procedures for acquiring the needed land. The complexity of these procedures does not necessarily reflect the value of the land or the associated social or economic impacts. The DOE is aware of the socioeconomic impact of acquiring lands, especially privately owned lands, and the socioeconomic aspects of land acquisition are

considered under the socioeconomics guideline. For example, the DOE recognizes that the condemnation of privately owned lands could disrupt the lives of displaced landowners.

Issue

One commenter recommended that the Richton Dome site be ranked last, just below the Deaf Smith site, because there are more landowners at Richton Dome than at Deaf Smith.

Response

The DOE has not determined exactly how many landowners there are at the Deaf Smith and the Richton Dome sites. If one or both of these sites are recommended for site characterization, the DOE will identify the affected landowners as part of the formal land-acquisition process.

C.3.4.2.1.3 Meteorology

Issue

One commenter stated that it is not possible to make a comparative evaluation of the sites against the meteorology guideline, because of the lack of data and inconsistencies in the types and quantities of data available for the various sites.

Response

The siting guidelines acknowledge that complete data would not be available for all evaluations of the sites against the guidelines. The guidelines provide for evaluating sites on the basis of available data. In evaluating the sites against the meteorology guideline, the DOE used best estimates based on available data and conservative assumptions.

Issue

Several persons commented on population considerations under the guideline on meteorology. One commenter stated that the size of offsite populations has not been appropriately considered under the ranking. Another noted that site comparisons would be facilitated if all EAs expressed population density as "persons per square mile" rather than "population densities higher than average." Another commenter requested that the workers employed at the Hanford Site be considered under this guideline.

Response

The meteorology guideline is concerned primarily with meteorological conditions and events that could affect the transport of radioactive materials to persons beyond the boundaries of the site. The characteristics of offsite populations are considered separately under the guideline on population density and distribution. Meteorological information is combined with information about the population to evaluate the sites under the system guideline for preclosure

radiological safety. If in comparing the sites against the meteorology guideline the DOE used population characteristics other than those specified by the guideline (i.e., location and density relative to regional density), double counting for population conditions would result.

The workers at the Hanford Site have been considered in determining the regional population density and in the final EA are specifically addressed under the guideline on population density and distribution.

Issue

Some commenters noted that the draft EAs for the Davis Canyon and the Hanford sites were inconsistent in the evaluation of the first potentially adverse condition of the meteorology guideline, and this inconsistency is reflected in the comparative evaluations of Chapter 7. The draft EA for Davis Canyon states that the town of Moab, 33 miles downwind, is close enough for the first potentially adverse condition to be present. However, the draft EA for Hanford says that the downwind city of Richland is sufficiently far from the site (22 miles) for the first potentially adverse condition to be not present. Similarly, the Hanford site, which appears to have more stagnation episodes than Davis Canyon, was ranked higher for dispersion conditions.

Response

The EAs have been revised to take a consistent approach on this condition. They define "prevailing meteorological conditions" to mean the most common annual average wind direction in any 22.5-degree sector and consider nearby population centers to be within a radius of 50 miles from the site, unless it is possible to document that atmospheric dispersion is sufficient to permit a smaller radius. As a result of this approach, the final EAs for both the Davis Canyon and the Hanford sites consider this potentially adverse condition to be present.

Issue

The Hanford site is not considered to have the second potentially adverse condition, which pertains to extreme weather, although Chapter 3 of the EA shows that part of the site would be inundated by the probable maximum flood and that the area has experienced a maximum snowfall of 24.5 inches.

Response

The second potentially adverse condition refers to the historical frequency of extreme weather. The probable maximum flood is a statistical worst-case flood. The DOE considers the 100-year flood to be an appropriately severe flood for this condition. The record snowfall occurred in 1916 and is not considered representative of recurrent conditions in the area of the site.

C.3.4.2.1.4 Offsite installations and operations

Issue

One person asked the DOE to explain how two sites with the same number of deleterious conditions can have different utility values. Another commenter suggested that the Hanford site be disqualified under this guideline because of conflict with nearby atomic-energy defense activities or, if it can be demonstrated that the conflict is not irreconcilable, that the ranking of the site be significantly lowered.

Response

Section 6.2.1.5 of the EA for the Hanford site demonstrates that there will be no irreconcilable conflict between a repository and nearby atomic-energy defense activities.

Issue

One party asked the DOE to identify the other nuclear installations that contribute to radioactive releases in the area of the Davis Canyon site.

Response

The contributing facilities are three uranium mines. They are discussed in Section 7.3.1.1.4 of the draft EA for the Davis Canyon site.

C.3.4.2.2 Environment, socioeconomics, and transportation

This group of preclosure guidelines consists of separate guidelines on (1) environmental quality, (2) socioeconomic impacts, and (3) transportation.

C.3.4.2.2.1 Environmental quality

Issue

A commenter requested that the sites be compared on the basis of their relative risk to water resources.

Response

The final EAs contain an evaluation of compliance with the ground-water protection requirements of the final EPA standards, 40 CFR Part 191 (EPA, 1985). These standards require that the repository may not cause the radionuclide concentrations in "a special source of ground water" to exceed specified limits for 1,000 years after waste emplacement.

The presence of sources of ground water suitable for crop irrigation or human consumption without treatment is potentially adverse condition 2 of the postclosure guideline on geohydrology. The comparative evaluation of sites

did include this condition (see Sections C.3.4.1.2 and C.5.1 for comments on geohydrology). In addition, the comparative evaluation included in the disqualifying condition for the preclosure guideline on socioeconomic impacts pertains to significant effects on the quantity or the quality of water from major water supplies (see Sections C.3.4.2.2 and C.7.4).

Issue

One commenter contended that the EA for the basalt (Hanford) site should acknowledge the presence of potentially adverse conditions regarding (1) projected major conflicts with environmental requirements and (2) significant adverse environmental impacts that cannot be avoided or mitigated. This contention was based on claims of uncontained hazardous materials and controversy over the discharges of radioactive materials from DOE facilities at Hanford.

Response

The guideline on environmental quality is concerned with significant adverse environmental impacts at the repository site. It does not address the effects of unrelated activities.

Issue

One commenter stated that the DOE has not done the work to determine whether or not significant Yakima Indian cultural or religious resources would be adversely affected, especially in light of previous effects on Gable Mountain. He felt that the fifth potentially adverse condition should be considered present at the Hanford site.

Response

Parts of Gable Mountain have been examined by a reconaissance-level study that identified Gable Mountain and Gable Butte as having religious significance to local Indian groups. The DOE maintains that site characterization and repository development can be performed at the Hanford site without exerting any significant adverse effects on any significant Native American religious or cultural resources.

Issue

One person felt that the ranking of the Richton site should be lowered because environmental impacts would be experienced by the persons living at the site.

Response

The nearness of the town of Richton has been given due consideration in the evaluation of that site against the guideline on population density and distribution (see Sections C.3.4.2.1 and C.6.1 for comments on that guideline). To consider the population of Richton in evaluations against the guideline on environmental quality would result in double counting.

Issue

Several commenters said that greater emphasis should be placed on the proximity of the Davis Canyon site to the Canyonlands National Park.

Response

The guideline on environmental quality calls for an assessment of effects on any national parks and of irreconcilable conflicts with a park. The final EA for the Davis Canyon site presents such an evaluation for the Canyonlands National Park; the evaluation uses criteria developed by the National Park Service to test for irreconcilable conflicts. (See also Sections C.3.3 and C.7.1.)

Issue

One person said that the comparative evaluations should consider the uncertainties about the ability of the Deaf Smith site to comply with the requirements of the Texas Mine Shaft Act.

Response

The DOE acknowledges that uncertainties about compliance with environmental requirements should be considered in the comparative evaluation. The evaluation of the Deaf Smith site has been revised to address the uncertainty about compliance with the Texas Mine Shaft Act.

Issue

One commenter asked whether the DOE will guarantee protection of the Ogallala aquifer or, if not, how the DOE proposes to mitigate any releases into the Ogallala.

Response

It is the DOE's position that the quality of the environment at the Deaf Smith site can be adequately protected. Sections 4.2.1.4 and 5.2.2 of the Deaf Smith EA address protection of the Ogallala aquifer.

Issue

Several issues were raised about the Davis Canyon site. One commenter stated that air-quality impacts are double counted, being considered both under the environmental quality and the meteorology guidelines. Several commenters questioned the DOE's ability to determine the presence of an irreconcilable conflict with the Canyonlands National Park, since it appears that the DOE is not fully aware of the Park's designated uses. A commenter felt that, since neither favorable condition is present, the Davis Canyon site should possess both corresponding potentially adverse conditions. A commenter agreed that the site has the third potentially adverse condition, but believes it should have the fourth as well. It was noted by one commenter that the Davis Canyon site discussion should include the possibility of critical habitat. A commenter noted that the findings for the Davis Canyon site under

the first and the third disqualifying conditions were based on insufficient data and questioned the statement that repository-related activities will be conducted within the park.

Response

The only evaluation of air-quality impacts occurs under the environmental quality guideline. The meteorology guideline is concerned primarily with radiological safety; it addresses only those meteorological conditions and phenomena that affect the transport of radioactive material to offsite areas.

The DOE has expanded the evaluation of Canyonlands National Park and possible impacts throughout Sections 4.2 and 5.2, with summaries presented in Sections 4.4.1 and 5.5.1. The results of the evaluations show that there will be no irreconcilable conflict with the uses of the park.

The guideline did not intend for the pairs of first and second conditions to be reciprocal. Each pair delineates a possible range for that condition. Therefore it is possible to not have either condition. For example, on the second set the favorable condition is not present because it cannot be projected that impacts will be mitigated to insignificant levels. The corresponding potentially adverse condition is not present, however, because it is projected that significant impacts can be mitigated to acceptable levels.

Because of potential effects on the Newspaper Rock State Historical Monument, the evaluation of the Davis Canyon site was revised to state that the fourth potentially adverse condition is present. A summary of possible critical habitats was added to the comparative evaluation, but the finding for the sixth potentially adverse condition was not changed.

The evaluation of potential effects on the Canyonlands National Park has been revised and expanded, but the finding that the site is not diqualified (see Section 6.2.1.6.4) was not changed. It remains the DOE's position that no repository-related activities will need to be conducted in the Park.

The DOE considers the revised comparative evaluation to place an appropriate emphasis on the proximity of the Davis Canyon site to Canyonlands National Park. This evaluation is supported by Sections 4.4.1 and 5.5.1, which have been added to the EA for the Davis Canyon site.

C.3.4.2.2.2 Socioeconomic impacts

Issue

One commenter stated that, in evaluating the sites on Federal land, acceptance by the local population at present should not be weighted too highly because the acceptance must persist for 1,000 to 10,000 years.

Response

Acceptance by the local population is not directly considered in the comparative evaluation of sites because it is not included in the siting guidelines. Public acceptance, however, may affect the degree of conflict between old and new residents and can be used as an indicator of social impacts. In this light, the DOE does consider public acceptance as a contributing factor to the potential for social impacts. The long duration of the repository is acknowledged by the siting guidelines, which assign primary importance to postclosure conditions.

Issue

One commenter expressed concern over the choice of Hanford as a site for characterization, saying that whether a repository would help to "stabilize general economic conditions" is not as important as the long-term safety of the site. The commenter stated that the Columbia River, which borders on the Hanford Site, is used for irrigation and that site characterization at Hanford could adversely affect the agricultural economies of the States of Washington and Oregon.

Response

In order to be considered for a repository, a site must meet the qualifying conditions of all the siting guidelines. Failure to meet even one condition will disqualify the site. The objective of the guidelines is to ensure that any site selected for a repository will meet all the regulatory requirements for the protection of the health and safety of the public and the quality of the environment. The ability to meet these requirements will have to be demonstrated to the satisfaction of the Nuclear Regulatory Commission, which will issue the authorization to construct the repository.

The DOE does not expect that site characterization for the Hanford site would adversely affect agriculture in the State of Washington or Oregon. Since no radioactive waste would be accepted at the site during this phase, there is no potential for radioactivity to enter the Columbia River through ground-water seepage.

Issue

One commenter suggested that the comparative evaluation of the Deaf Smith and the Richton sites against the guideline on socioeconomic impacts should rank Richton lower. This commenter stated that Deaf Smith's ranking was based on impacts to agriculture, but that we currently have more agricultural land in production than needed. Another commenter suggested that ranking the Deaf Smith site higher than Davis Canyon on socioeconomic impacts was arbitrary because the discussion states that in-migration requiring mitigation will occur at both sites and that effects on agriculture, a major sector of the economy of Deaf Smith County, are possible. Two commenters objected that the DOE had failed to consider any of the most important socioeconomic impacts.

Response

Chapter 7 of the final EAs presents a revised discussion of the comparative evaluation against the socioeconomics guideline, including the reasons the Richton Dome site is believed to be slightly more favorable in terms of socioeconomic impacts than the Deaf Smith site and why it is expected that socioeconomic impacts would be most severe at the Davis Canyon site. For example, Chapter 7 explains why the potential for effects on community services is greater at the Richton Dome site than at the Deaf Smith site and why in-migration would exert more severe effects at Davis Canyon site than at Deaf Smith. Chapter 7 also discusses the agricultural industry near the Deaf Smith site as an important primary sector of the economy that supports significant employment and business sales. The DOE does not believe that the evaluation of potential socioeconomic impacts at the Deaf Smith site can be based on the amount of agricultural land in production in the United States.

The guideline on socioeconomics addresses the most significant impacts that may be induced by a repository. The favorable and potentially adverse conditions of that guideline were widely reviewed by the States, affected Indian Tribes, Federal agencies, and the public during the consultation process for the guidelines.

Issue

Many commenters objected that the 1980 data presented in the draft EA for the Davis Canyon site are out of date and lead to a misrepresentation of the potential socioeconomic impacts of locating a repository in the area. One commenter stated that housing is available in the area, the vacancy rate being 15 to 20 percent. Other persons said that the current unemployment rate reported by the Utah Department of Unemployment Security is 23 percent whereas the draft EA reports 7 percent. Another commenter noted that the area has an abundance of water to sell and that the sewage-treatment plant was built to accommodate an increase in populations, but the area has recently experienced a decrease in population. Similarly, several other parties noted that, whereas in 1980 the area's population was booming, the area is losing population. Others explained that Grand and San Juan Counties had experience in handling "boom" conditions and had successfully handled two uranium and one oil boom. Many commenters pointed out that the testimony at the public hearings in Utah and Texas showed that some residents of southeastern Utah feel that the socioeconomic impacts would be both favorable and manageable, while the residents of the Texas Panhandle believe that the socioeconomic impacts on the town of Vega and the general agricultural economy would be dramatic and severe. All of these commenters, therefore, suggested that the Davis Canyon site should be ranked higher on the socioeconomics guideline and at least above the Deaf Smith site.

Response

Having considered and evaluated the comments and the information included in them, the DOE has revised the discussion of milling operations in the area of the Davis Canyon site. The recent suspension of mining and milling operations in the area has caused local socioeconomic conditions to change, with currently greater housing availability, higher unemployment rates, lower

school enrollments, lower per capita incomes, and greater out-migration. Section 3.6 of the EA for Davis Canyon has been updated in regard to information on housing, personal income, unemployment rates, school enrollment, and the total population.

The DOE, however, does not believe that the Davis Canyon site should be considered more favorable than the Deaf Smith site for socioeconomics. Davis Canyon is still the only site where the analysis predicts significant repository-related impacts on community services, housing supply, and local government agencies in the affected area (see the evaluations of the sites against the first favorable and the first potentially adverse conditions of the socioeconomics guideline).

Issue

One commenter asked the DOE to clarify the first full paragraph on page 7-84. This paragraph, which discusses potentially adverse conditions for socioeconomics, states that "at Davis Canyon, water requirements are also not expected to adversely affect future development; however, this judgment is preliminary, as there is some uncertainty about potential short-term disruption of the area water supply during repository construction at this site." The commenter asked whether this statement implied disruptions of ground water at the site.

Response

The statement does not imply disruptions of ground-water systems at the site. The judgment is preliminary because it depends on the completion of two new reservoirs in the Blanding and Monticello areas. The San Juan Planning Council expects to build these two new reservoirs to take care of economic development needs and is willing to sell or lease part of its appropriations.

Issue

One commenter asked how the repository's effect on the High Plains aquifer in Texas would change if farmers move to dry-land crops or significant reductions in water use.

Response

Trends toward dry-farming could make the relative impact of withdrawing water for repository-related uses much more severe. The final EA does consider this trend and the potential for relatively more severe effects on water rights as well as consequent effects on future development near the Deaf Smith site.

Issue

One commenter recommended that the DOE use the disqualifying condition for the socioeconomics guideline to disqualify the Deaf Smith site; this disqualifying condition pertains to adverse impacts on water quality or quantity. The same commenter stated that, even if the DOE proceeded to rank the five nominated sites, it should not rank the Deaf Smith site as a preferred site.

Response

Because the DOE can mitigate or compensate for the adverse impacts on water quality and quantity, the Deaf Smith site is not disqualified on the basis of the socioeconomics guideline. The need to acquire water rights that could affect future development in the area was considered in the comparative evaluation of the five nominated sites against the socioeconomics guideline. The selection of preferred sites, however, depends on a comparative evaluation of the nominated sites against all of the siting guidelines.

C.3.4.2.2.3 Transportation

Issue

Several commenters stated that certain factors were not adequately accounted for in the relative ranking of the sites. Examples of such factors are cost, the emergency-response capabilities of affected States, and weather hazards. One commenter alleged that only distance was considered.

Response

All of the factors in the transportation guideline were considered during the comparative evaluation of sites. These factors include, but are not limited to, those mentioned by the commenters: cost, emergency-response capabilities, weather hazards, and distance. The evaluations of the favorable and potentially adverse conditions for each site in Section 6.2.1.8 of the final EAs discuss the information used to reach the findings on the guideline conditions.

Issue

Commenters noted that the draft EAs do not state what weight was given to the various conditions of the transportation guideline. It was also suggested that certain favorable conditions, such as cost and risk, should be weighted more heavily than others. These commenters contended that the DOE had stated publicly that national cost and risk would be weighted at half the total transportation ranking, but no similar statement is contained in published documents.

Response

The DOE agrees that national cost and risk should be weighted more heavily than the other factors in the transportation guideline. In the draft EA, the DOE considered national cost and risk (favorable condition 5 of the transportation guideline) to be weighted at 50 percent of the total importance of that guideline. A detailed explanation of the process used to evaluate the transportation conditions of the nominated sites for recommendation is contained in the multiattribute utility analysis of the nominated sites.

Issue

Several commenters expressed disagreement with the finding made by the DOE on the transportation-guideline conditions. They felt that, on the basis of the data presented, several of the findings for the favorable and potentially adverse conditions were unjustified. One commenter questioned that only the Richton site received a finding of "present" on favorable condition 5 (national cost and risk), and not Deaf Smith and Davis Canyon as well. Also noted were inconsistentcies in the data for the various sites.

Response

Several of the findings for the favorable and potentially adverse conditions of the transportation guideline have been revised in the final EAs. These revisions are based on responses to public comments, additional data, and additional analyses. To ensure consistency among the sites for the guideline-condition findings, a common set of criteria was applied. The DOE believes that all the findings reported under the transportation guideline in the final EAs are valid at this stage of the site-selection process. The rationale for each finding for each condition is presented in Section 6.2.1.8 of the final EAs.

Some of the favorable and potentially adverse conditions require a comparison among sites, and hence only one site can receive a finding of "present." These conditions are so noted in Section 6.2.1.8 of the final EAs. For example, favorable condition 5 contains the phrase "which are significantly lower than those for comparable siting options"; for this condition, only one site--the site with the lowest costs and risks--can receive the finding of "present." It should be noted, however, that in the comparative evaluation of sites all available data for each site for each guideline condition were considered.

C.3.4.2.3 Ease and cost of siting, construction, and closure

Issue

A commenter questioned why the DOE did not rank the sites with respect to the system guideline on the ease and cost of siting, construction, operation, and closure. The commenter argued that a "ballpark" figure would be useful and implied that the DOE avoided this because the result would be unfavorable to the Hanford site.

Response

As explained in this appendix and in the EAs, only preliminary assessments of performance against the system guidelines are possible at present (i.e., before site characterization), and the DOE feels that the results of such preliminary assessments would be inappropriate as bases for site-selection decisions.

Issue

Another commenter pointed out that the way that the EAs report costs makes ranking the sites on this basis difficult. The use of reference cases does not allow the site-specific construction and lifetime costs to be considered. The commenter was critical of the DOE's estimates of uncertainty, pointing out that cost overruns on some nuclear projects have exceeded 100 percent.

Response

The cost estimates in the EAs were based on the estimates of the total-system lifecycle costs that the DOE prepares annually each year for submittal to Congress as part of the fee-adequacy report. The repository is not comparable to nuclear power plants, some of which have indeed experienced large cost overruns. Furthermore, the DOE is financially accountable to Congress, and the expenditures of the repository program are audited by the General Accounting Office.

C.3.4.2.3.1 Surface characteristics

Issue

Some commenters felt that the interpretation of the potentially adverse condition of the guideline on surface characteristics was inconsistent in the various EAs and that the sites that are subject to potential flooding were not evaluated equitably: the Hanford, Yucca Mountain, and Richton sites were given credit for flood protection through engineering measures, whereas the Davis Canyon, Lavender, Cypress Creek, and Vacherie sites were not given credit for flood protection.

Response

The DOE has decided that flood protection through engineering measures cannot be considered in evaluations against the potentially adverse condition of this guideline because by allowing credit for such flood protection the DOE would eliminate a discriminating condition for this guideline. As a result, the Hanford, Yucca Mountain, and Richton sites were given a finding of "present" for this condition.

Issue

Some commenters pointed out that the Davis Canyon site was penalized in two guidelines (transportation and surface characteristics) for the rugged terrain that would be traversed by the access road and railroad. This penalty could be avoided by locating the surface facilities eastward in the flats away from the cliffs.

Response

Each site must be evaluated against every guideline regardless of any apparent duplication of penalties for site conditions. The Davis Canyon site

contains rugged terrain; therefore, the favorable condition is not present. If the site is characterized, the plans for the layout of the surface facilities could be changed.

C.3.4.2.3.2 Rock characteristics

Issue

One commenter asked why the Hanford site was ranked lower on preclosure rock characteristics than the Deaf Smith and the Yucca Mountain sites.

Response

Since more exploration activity has occurred at the Hanford site than at the other sites, more data have been collected. Some of these data indicate that there are more conditions posing potential problems at this site than at the other sites. The conditions underground will not be adequately sampled until exploratory shafts have been sunk and underground excavations have been made at all sites.

Issue

One commenter asked whether a change in the buffer zone at Richton could change the degree of flexibility available at Richton and even require the use of a two-level design.

Response

Chapter 6 of the EA for the Richton Dome site has been revised to identify the assumptions and measurements made in claiming sufficient flexibility in preclosure rock characteristics. Several changes (not just the size of the buffer zone) could require the use of a two-level design at the Richton site.

Issue

One commenter questioned the Hanford site's being given a finding of "not present" for potentially adverse conditions 2 and 3.

Response

Chapter 6 of the EA for the Hanford site has been revised to explain the basis for these findings.

Issue

One commenter took issue with the small difference in rating between the Deaf Smith and the Davis Canyon sites for both preclosure flexibility and for ease of operation.

Response

Flexibility is only one of eight conditions considered in evaluating the sites on preclosure rock characteristics.

Issue

One commenter felt that the potential for high-pressure water inflow in regions of fractured rock will require "innovative engineering" and incur high costs at the Hanford site.

Response

The measures that would be required to mitigate these conditions are routinely used in mining. They are explained in Section 6.3.3.2.6 of the final EA for Hanford.

C.3.4.2.3.3 Hydrology

Issue

Several commenters questioned the appropriateness of the relative ranking of the five sites on the preclosure guideline on hydrology. One comment noted that the importance of the complexity of ground-water-control measures should not be equated with the potential for flooding or the availability of water. Another stated that the potentially adverse condition of ground-water conditions requiring complex engineering measures that are beyond reasonably available technology is present at Hanford, and therefore this site should be disqualified or heavily penalized in the relative ranking. A few comments stated that the relative rankings of Deaf Smith and Hanford were too favorable and should not be equal to those of Davis Canyon and Richton.

Response

As explained in Chapter 7 of the final EAs, the complexity of ground-water-control measures is indeed considered more important than the potential for flooding and the availability of water. The DOE does not agree, however, that the potentially adverse condition for the hydrology guideline is present at the Hanford site. The design features and construction techniques that would be used to minimize ground-water inflow into shafts and drifts at the Hanford site are based on mining experience under saturated conditions. The range of ground-water inflow conditions that are expected at Hanford can be accommodated with conventional design and construction methods; requirements for engineering measures beyond reasonably available technology are not expected. However, the relative complexity of ground-water-control measures at Hanford, as compared with the other sites, was taken into account.

Issue

One commenter noted that the Davis Canyon site was not correctly ranked on the hydrology guideline. Davis Canyon has enough flat land above the floodplain for construction and, unlike the other salt sites, has no large aquifers that require freezing for shaft sinking.

Response

The DOE agrees that, unlike the other two salt sites, the Davis Canyon site has no aquifers that require freezing for shaft sinking because only minor aquifers are present above the host rock. This favorable attribute was considered in the comparative evaluation of sites against the hydrology guideline. However, the location of the surface facilities of the repository is dictated by the need to mitigate visual aesthetic impacts to an acceptable level. Therefore, the DOE does not have the option of to locating a repository at the Davis Canyon site on flat land above the floodplain.

Issue

One commenter felt that the finding for favorable condition 3, the availability of water required for repository construction, operation, and closure, should be changed to "not present" for the Davis Canyon site. The estimated water requirements for the project do not include the water needed for mitigation measures, such as site revegetation and water sprays to suppress dust. Moreover, purchasing existing water rights would foreclose uses dependent on existing water rights and would adversely affect new development in the area.

Response

The DOE has revised the table on repository characteristics in Chapter 5 of the final EA for the Davis Canyon site to clarify the water-resource requirements for the repository. The DOE acknowledges that withdrawal from the Colorado River, if this resource is used, would contribute to the increasing demand on the region's sparse water resources.

Issue

One commenter asked what preliminary data indicate that at the Deaf Smith site adequate quantities of water can be obtained from the Dockum Group.

Response

Well yields in the vicinity of the Deaf Smith site are in the range of 400 to 900 gallons per minute.

Issue

One comment noted that Yucca Mountain is not as favorable as the text suggests and that the difference between Yucca Mountain and the other sites is not substantial.

Response

With respect to the Yucca Mountain site, the ability to locate the repository in the unsaturated zone, where minimal measures for ground-water control will be required, minimal potential for flooding, and an ample supply of water at the site for repository siting, construction, operation, and closure are favorable for this site. It is not clear from the comment what features of the Yucca Mountain site were considered adverse by the commenter with respect to the favorable ranking on the hydrology guideline.

C.3.4.2.3.4 Tectonics

Issue

A number of commenters expressed concern that the DOE has not adequately considered all information in ranking sites on the preclosure guideline on tectonics.

Response

The comparative evaluations of sites in the draft EAs were based on the information available for the qualifying, favorable, and potentially adverse conditions as they influence the potential for ground motion and fault displacement. The final EAs more explicitly discuss the expected effects of earthquake ground motion and fault displacement for each site; the discussion is based on the evaluations.

Issue

Some parties questioned the evaluation of the Yucca Mountain site, particularly with respect to the potential effects of nearby faults and in-situ stress, the derivation of ground-motion estimates, and the potential use of NRC criteria for nuclear reactors (10 CFR Part 100, Appendix A).

Response

As discussed in Chapter 7 of the final EA, there are uncertainties about potential ground motion and the time of the last movement on faults near the site. However, these uncertainties are not so large as to preclude the findings that must be made at this stage of the site-selection process. The data needed for higher-level findings will be collected during site characterization.

The NRC has said that (see page 103 of the NRC comments on the draft EA for Yucca Mountain) "at the present time, it is premature to state that the design requirements for nuclear power plants are the same as those required for a waste repository. The DOE should consider stating at this time that the design requirements of structures important to safety will comply with 10 CFR 60 and appropriate EPA regulations." The DOE agrees and has never intended or stated that reactor criteria would or should be used. The DOE is developing an approach to determining the appropriate earthquake inputs for repository design. An annotated outline of this approach was sent to the NRC for comment on June 20, 1985.

No quantitative statements about earthquake probability and magnitude can be made at present on the basis of stress data. In deriving estimates of potential ground motion for Yucca Mountain, the DOE did not ignore the nearby faults, but did not explicitly consider each fault because the magnitude and the probability of earthquakes on these are not known. The DOE's judgments are based on the data base for strong ground motion and on the type and levels of ground motion that other facilities have been designed for.

C.3.4.3 Decision method

The method used to identify the preferred sites for recommendation, described in Section 7.4 and Appendix B of the draft EAs, elicited many comments. As already mentioned in the introduction to Section C.3.4, the DOE, in response to these comments, developed a more formal decision-aiding methodology that was reviewed by the National Academy of Sciences. A detailed description of this methodology is presented in the multiattribute utility analysis of the nominated sites, which also shows how the methodology was applied in terms of the siting guidelines. Thus, comments on the methodology applied in the draft EAs, the process used for identifying preferred sites, and the choice of preferred sites are not addressed here; only summaries of the various issues that were raised in these comments are presented in order to show the concerns of the commenters.

Among the comments was an objection to the statement in Section 7.1.2 of the draft EAs that "disqualifying conditions did not enter directly into the comparison of sites." This happened because the disqualifying conditions could not be used to discriminate between sites. Each of the potentially acceptable sites was evaluated against the disqualifying conditions (see Section 2.3 of the EAs), and no disqualifying conditions were found at any site. Had a disqualifying condition been found at any site, that site would have been removed from further consideration and would not have included in the evaluations of Chapter 7.

Many commenters said that the importance of individual guidelines in a group of guidelines should not be equal, and some suggested specific guidelines that should be considered more important than others in the same group. Some suggested that the importance of specific guidance should vary from site to site. These suggestions contradict the provisions of the implementation guidelines, which specify the relative importance to be assigned to each group of guidelines and state that, within a group, all guidelines are of equal importance.

The issues that were raised in the comments on the decision method are summarized below.

- The evaluation process described in Chapter 7 of the draft EAs is arbitrary and confusing.
- There is little correlation between the findings reported in Chapter 6 and the rankings in Chapter 7.

- The methodology is unsatisfactory, inadequate, undocumented, and biased. The averaging and the pairwise comparison methods are not satisfactory because the spread in rankings is artificially determined; the utility estimation method can be valid for comparisons against the preclosure guidelines but is not adequate for assessing postclosure performance.

- Aggregation procedures are valid only if the guidelines are complete and not redundant, but some guidelines are redundant (i.e., population is considered in the guidelines of population density and distribution, meteorology, environmental quality, socioeconomics, and transportation).

- The aggregation of rankings compounds the subjectivity of the application of the guidelines.

- Alternative decision methodologies might result in the identification of different sites as preferred for characterization.

- The methodology of comparison should be highlighted as a stand-alone issue.

- A sensitivity analysis should be performed and documented.

- The DOE should find a site adequate under the postclosure guidelines before considering its rank under preclosure guidelines.

- The aggregate ranking does not consider interactions among major factors.

- The weighting used for the various conditions of each guideline is not explained; hence the basis for the score on each guideline is not clear and cannot be replicated. Furthermore, if all conditions are of equal weight, then any one condition is not very important.

- The weighting of the postclosure guidelines with respect to the preclosure guidelines is too low and not justified.

- Because three postclosure guidelines cannot be used to discriminate among sites (climatic changes, erosion, and site ownership and control), the inclusion of these guidelines in the aggregate rankings reduces the weight assigned to the other postclosure guidelines.

- The weighting of 35:33:32 for the three groups of preclosure guidelines assigns similar weights to the three groups, contradicting the requirement of the implementation guidelines that the three groups be assigned a specified order of importance.

- Because the weighting was adopted without rulemaking proceedings, its use violates the public participation and rulemaking requirements of the Act, the DOE Organization Act, and the Administrative Procedures Act.

- Because the application of the methodology is contingent on the professional qualification and experience of the members of the evaluation team, the DOE should provide such information about every team member.

The DOE carefully considered these issues in the development and application of the decision-aiding methodology.

C.3.4.4 Miscellaneous comments on the nomination and recommendation process

The DOE received many comments that addressed various aspects of the process of site nomination and recommendation and the results reported in Chapter 7 of the draft EAs. Many of these comments approved of the sites identified as preferred for recommendation; one party submitted an independent evaluation that supported the choice of sites reported in Section 7.4. Many other commenters, however, disagreed with the sites identified as preferred. As already explained, the DOE developed a formal decision-aiding methodology for the ranking of sites. The results will be presented in the multiattribute utility analysis of the nominated sites and the recommendation of candidate sites, which are being issued separately.

Summarized and answered below are various other issues raised in comments on the nomination and recommendation process.

Issue

Some commenters said that four of the potentially acceptable sites should not have been excluded from the comparative evaluation in Chapter 7 because the exclusion of the four sites might have altered the outcome of the site rankings. Some parties also asked what happens to the four potentially acceptable sites that were not evaluated in Chapter 7.

Response

Section 112(b)(1)(E) of the Act requires each EA to include a reasonable comparative evaluation of the nominated site against the other sites and locations that have been considered. The siting guidelines (Section 960.3-2-2-3) require that the nominated site be evaluated against all other such sites. In this context "such sites" has been taken to mean other nominated sites. Therefore the comparative evaluation of sites against the guidelines considers the five sites proposed for nomination.

It is not true that the four remaining site have been excluded from a comparative evaluation against other potentially acceptable sites. As specified by the siting guidelines (Section 960.3-2-2-1), the selection of the preferred site in each geohydrologic setting that contains multiple sites was based on a comparative evaluation of the sites in that basin (see Section 2.4 of the EAs for the Davis Canyon, Deaf Smith, and Richton Dome sites).

The four sites not evaluated in Chapter 7 are not being recommended for characterization. They could, however, be considered again in the first-repository program if none of the characterized sites is accepted for repository development. They could also be considered in the second-repository program.

Issue

Commenters stated that the DOE should use the guidelines that do not require site characterization in selecting the preferred sites for characterization because the data are more available and more reliable. If this approach had been used, the rankings of the salt sites would have been different.

Response

The Act, in Section 112(b)(E)(i), requires that the sites be evaluated against all of the siting guidelines. Furthermore, many of the guidelines that require data from site characterization for the demonstration of compliance pertain to postclosure conditions that would affect the long-term safety of the repository.

Issue

A commenter applauded the DOE's use of conservative assumptions for preliminary performance assessments of the repository system and for present evaluations of potential environmental impacts, but suggested that the DOE should emphasize that actual repository performance at all sites is likely to be better than predicted because of these conservative assumptions. Commenters also noted that there are inconsistencies in the application of conservatism throughout the EAs.

Response

In its evaluations, the DOE used, where necessary, assumptions that approximate the characteristics or conditions considered to exist or expected to exist in the future at a site. These assumptions are realistic but conservative enough to underestimate the potential for a site to meet the qualifying condition of a guideline. The results of the analyses indicate that all of the sites are likely to meet the performance requirements. Given the limitations and uncertainty in the available information, statements that actual performance is likely to be better than predicted would be inappropriate. The DOE has attempted in the final EAs to ensure reasonable comparability among the sites in the degree of conservatism applied to similar analyses, such as ground-water-travel times.

Issue

Several commenters felt that nonconservative positions were taken when evaluating the sites against the guidelines in spite of a statement in Section 7.1.2 to the contrary. One commenter stated that a conservative assumption stated in Chapter 7, involving the vertical ground-water-travel time, was not implemented for the Davis Canyon site.

Response

The DOE feels that it has used conservative assumptions where insufficient data were available. It should be borne in mind, however, that at this stage in the site-selection process (i.e., nomination for site characterization) the qualifying and disqualifying conditions in the

guidelines need only meet the tests that evidence does not support a finding that the site is disqualified or does not support a finding that the site is not likely to meet the qualifying condition.

Regarding the specific comment, the conservative assumption stated in Chapter 7 involves a time of vertical travel through the interbeds in the evaporite sequence. Chapter 6 does not indicate that anything other than zero was used in estimating travel time through the interbeds when the total travel time through the evaporite sequence was estimated.

Issue

Commenters were concerned because the DOE did not rank the sites on the system guidelines. Some suggested that the DOE delay ranking the sites until enough data for performance assessments are available and repository technology is more developed.

Response

The DOE described the basis for site evaluations in Section 960.3-1-5 of the guidelines. This section indicates that comparisons between and among sites shall be based on the system guidelines to the extent practicable, and, if the evidence is not adequate to substantiate such comparisons on the basis of the system guidelines, then the comparisons shall be based on the groups of tehnical guidelines. As discussed in the EAs, the results of preliminary evaluations based on the system guidelines were presented in the EAs, but the objective was to demonstrate the status of capability at this point in the program, not to provide the basis for recommending sites for characterization.

The information needed to develop system performance assessments with sufficient confidence to use them for applying the system guidelines can be gathered only during site characterization. This fact, together with the schedule mandated by Congress for repository development, makes it imperative that the sites to be characterized be chosen expeditiously.

Consistent with the Act, the applicable NRC regulations in 10 CFR Part 60, and the DOE's siting guidelines, the DOE believes that it is appropriate and prudent to proceed with site characterization in order to obtain the information needed for selecting one site for development as a repository, advancing the designs of the repository and the waste package, and completing a license application to the NRC.

Issue

Some commenters criticized the data bases for the analyses presented in the EAs.

Response

The DOE has met the intent of the Act to use available information to recommend sites for characterization (see Section 112(b)(3)) and has been consistent with the guidelines in making the findings required for nomination and recommendation (10 CFR Part 960, Appendix III).

Issue

Several commenters expressed concern over differences in the data bases for different sites.

Response

The information available for the various sites is admittedly nonuniform in accuracy and extent. However, it meets the requirements of the Act and of the siting guidelines for this stage of the site-selection process. The detailed data needed for later decisions will be collected during site characterization.

Issue

One commenter stated that the DOE does not have sufficient data to compare the Deaf Smith site with the other four nominated sites. The commenter cited a lack of site-specific data in many technical areas.

Response

The DOE recognizes that the data used in comparing the sites are not uniform. However, the DOE feels the data are sufficient to choose the sites for nomination and recommendation for site characterization; meet the requirements of the Act and of the siting guidelines.

Issue

One commenter remarked that site selection for characterization is pointed toward ease of public acceptance rather than the technical quality of the site. The commenter pointed to the proximity of DOE facilities to two of the sites as evidence that prior public acceptance of DOE installations was a major consideration.

Response

The process to be followed in recommending sites for characterization is specified in the Act. Included in that process is evaluation against the siting guidelines. In this evaluation, each site must be shown likely to meet all of the technical guidelines. Public acceptance is not directly considered. (It is considered indirectly as part of evaluations against the socioeconomics guideline). The proximity of DOE installations to two of the sites is, at least in part, a consequence of a Congressional mandate to search for sites on Federal lands dedicated to nuclear activities. That search led to the Hanford and the Yucca Mountain sites.

Issue

One commenter said that, whereas the Act requires a comparative evaluation in an EA for each nominated site, Chapter 7 compares only five sites. Therefore, only those five can be among the sites finally nominated. The commenter said that to nominate any other site would require new draft EAs or EA supplements for that site and new comparative evaluations.

Response

While Chapter 7 only compares five sites, the comparisons of sites within each geohydrologic setting, when taken together with Chapter 7, provide a comparison of all nine sites. The procedure of comparing sites in each geohydrologic setting to identify sites for nomination and then performing a compartive evaluation of the nominated sites follows the requirements of the siting guidelines, Section 960.3. New draft EAs will not be necessary unless there is a change in the preferred sites within a geohydrologic setting.

Issue

One commenter noted that no worst-case analyses were done for the sites, but courts have ruled that such analyses are required for demonstrating compliance with the National Environmental Policy Act.

Response

The EAs for geologic repositories are prepared under the statutory requirements of the Nuclear Waste Policy Act rather than the National Environmental Policy Act.

Issue

Several commenters suggested considerations that should be given the greatest importance in site evaluations. One said that the potential for harm to the Canyonlands National Park outweighs all other considerations. Another felt that safety is the most important criterion, followed by cost. Another commenter listed geologic stability, absence of ground-water intrusion, simple and regular transportation routes, and the ability to maintain repository integrity in spite of social upheaval as most important.

Response

The siting guidelines require that primary consideration be given to the postclosure guidelines. These include guidelines devoted to safety (postclosure), geologic stability, ground water (geohydrology), and long-term repository integrity. Furthermore, the preclosure guidelines are divided into three groups: radiological safety; environment, socioeconomics, and transportation; and EAs and cost of siting construction, operation, and closure. Those groups are specified to be in decreasing order of importance as listed above. It can be seen that the siting guidelines provide considerable constraint in the weighing, or at least in ranking the importance of, different factors used in evaluating and comparing sites.

Issue

One commenter felt that Chapter 7 did not explain how the evaluation of the favorable and potentially adverse conditions in the guidelines were related to the rankings given the sites.

Response

The approach used in the comparative evaluation of sites in Chapter 7 of the draft EAs was explained in Section 7.1.2, which discussed, among other things, the relationship between the favorable and potentially adverse conditions and the site rankings. It explained that the favorable and potentially adverse conditions, considered on balance and in relation to the qualifying condition, constitute the basis for ranking the sites.

Issue

One commenter suggested that all of the sites be characterized.

Response

Because of its high cost, the characterization of all nine sites would be an imprudent and unnecessary use of the funds collected from utility ratepayers.

Issue

A number of commenters stated that the waste should be disposed of at its point of origin and that the DOE should weigh regional considerations in siting the repository. Approximately 80 percent of the waste to be stored in a West Coast repository is generated east of the Mississippi, yet no States in the east are being considered for a repository.

Response

Among the nine sites found to be potentially acceptable for the first repository, and the five sites nominated as suitable for characterization is Richton Dome, which is in the State of Mississippi. In addition, the DOE is investigating potential repository sites in the north-central, northeastern, and southeastern regions. The study is investigating crystalline rocks of the eastern Appalachian region, but it was not sufficiently advanced to allow a crystalline-rock site to be included in the site-selection process for the first repository. The crystalline-rock program will be part of the effort to select a site for the second repository.

The Act requires consideration of regionality in selecting the second repository. Therefore, if the first repository is located in the west, the second repository may be located in a region closer to eastern nuclear power plants. However, it is important to remember that all sectors of the society benefit from nuclear power, either directly or indirectly, through the distribution of electrical power and decreases in the consumption of foreign and domestic oil. Therefore, the disposal of radioactive waste is a national problem. Although a State may not have a nuclear power plant within its boundaries, it is very likely that the State is, or will be in the future, consuming electricity produced by nuclear power plants outside the State. The paramount consideration in siting the repository is public health and safety, which cannot be sacrificed solely to ensure a regional distribution of repositories. If all host rocks and sites in the eastern United States were found unsuitable, then no repositories would be sited there.

Issue

Commenters were critical of the ability of DOE officials to make unbiased decisions. Some stated that political issues interfered with the site selection process. Specific concerns were stated as follows:

- Secretary Hodel's statements in Texas during the Congressional election race of Phillip Graham may have influenced site-selection decisions.

- The EAs were released one month after the election, rather than before, when they would have been a campaign issue. The commenter alleged that the schedule is being driven by politics.

- Political pressure may be brought to bear on the DOE to change the ranking of nominated sites. Several commenters felt that the residents of small towns and sparsely populated regions near the nominated sites do not have enough political clout to affect the choice of sites.

- Political and socioeconomic considerations should not outweigh safety and environmental considerations. Many commenters stated that the choice of Hanford was influenced by economic conditions in the region, and one commenter suggested that the government may be considering paying off the WPPSS bond in exchange for the State of Washington's agreement to locate the repository at Hanford. Other commenters stated that both the Yucca Mountain and the Hanford sites were recommended for characterization because, as federally owned sites, these would be less public opposition to these sites.

Response

Recognizing that the selection of a geologic repository should not be subject to political pressure, Congress specifically directed the DOE to issue guidelines to be used in selecting sites for a repository and specified the process to be used in site selections. The nomination and recommendation of sites for characterization were based on evaluation of the sites against the guidelines.

Former Secretary of Energy Donald Hodel did campaign in Texas on behalf of Representative Phillip Graham during the Congressional election of 1984. During that campaign, Secretary Hodel expressed his personal view that Mr. Graham would effectively represent Texans in the repository-development process. However, Secretary Hodel's participation in the 1984 campaign did not influence the evaluation of the potentially acceptable sites in the EAs. The identification of the Deaf Smith County as a preferred site for characterization was a technical decision that was not influenced by political considerations in view of the widespread opposition to a repository in Texas.

The collection and analysis of data for nine draft EAs was a complex and time-consuming process. The schedule was driven by the requirement of the Act for the DOE to prepare environmental assessments that include specific evaluations and analyses; the timing of the election had no influence on the schedule.

The DOE released the draft EAs for public comment and held briefings and hearings in the affected States. The DOE carefully considered the issues raised by individuals, public interest groups, States and Indian Tribes, and other Federal agencies submitted in writing or as testimony in the hearings. The DOE is confident that all citizens had ample opportunity to comment on the EAs. Any change in the rankings of the nominated sites would be due to additional data leading to changes in guidelines findings and not to political pressure.

The guidelines are structured to ensure that the protection of health and safety is heavily weighted in selecting sites for characterization. In no way do the economic conditions in an area override considerations of health and safety.

The Hanford site's close proximity to the WPPSS project has no influence on its nomination or recommendation for site characterization. The WPPSS program is an entirely separate program, and there has been no "tradeoff" agreement with the State of Washington.

While the DOE did initially look as Yucca Mountain and Hanford sites as part of its program to screen Federally owned sites, this is not the basis for nominating or recommending these sites for characterization. Each of these sites has been evaluated against the guidelines and has been found suitable for site characterization.

Issue

Some commenters observed that the draft EAs do not prove that the DOE has chosen the best sites for nomination and characterization. One commenter requested that the DOE repeat the ranking process for the nine potentially acceptable sites after site characterization completed, to make sure that the three sites characterized are the best sites.

Response

It is not necessary to choose the best sites for nomination and characterization; it is necessary to choose sites that are likely to meet all applicable regulatory requirements for the protection of public health and safety and would allow the geologic repository program to proceed in an expeditious and cost-effective manner.

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C.4 DATA BASE, PROPOSED ACTIVITIES, REPOSITORY DESIGN

This section addresses comments on the accuracy or adequacy of baseline information about the repository system, site characterization activities, and the site itself, that is used to evaluate site suitability and the impacts of developing the site. It includes almost all comments on Chapter 3 and on sections 4.1, 4.3, and 5.1 of the Environmental Assessment.

C.4.1 BASELINE CONDITIONS AT THE SITE

This category introduces subsequent discussion regarding baseline conditions at the site. General comments will be dealt with here; specific comments are addressed in later sections. One comment received in this category stated that fault activity, volcanism, and hydrothermal activity, groundwater travel-time calculations, free drainage of host rock, ground-water chemistry of the unsaturated zone, and other hydrologic and geochemical issues suggested that there may be significant problems in licensing because all of the issues are related directly to the isolation capability of the site. It was stated that these baseline conditions are adverse to the isolation capability of the site and cannot adequately protect the environment or the health and safety of the public. It was also suggested that Section 3.1 be revised to clearly state that Yucca Mountain is not on the Nevada Test Site.

Response

Analyses addressing the above topics in Chapter 6 of the Environmental Assessment (EA) show that no present evidence suggests that the Yucca Mountain site will not meet isolation requirements. It should be noted that the U.S. Department of Energy has taken the position that varying degrees of confidence are appropriate at different steps in the site selection process. Appendix III of 10 CFR Part 960 (1985) defines the findings for both qualifying and disqualifying conditions that are required at the time of selection of potentially acceptable sites, at nomination and recommendation of a site as suitable for characterization, and when repository site selection is made. The recommendation as suitable for site characterization is to be based on "... available evidence, evaluations, and resultant findings for the guidelines ..." (10 CFR 960.3-2-2-5, 1985).

During site characterization, additional site data, laboratory studies, and mathematical modeling will address the list of concerns cited in this comment, and extensive interactions with the Nuclear Regulatory Commission and the State of Nevada will help to establish when the degree of information is approaching that which will satisfy the appropriate regulations.

Section 3.1 of the EA accurately portrays Yucca Mountain's location as being immediately adjacent to the Nevada Test Site.

C.4.1.1 Geologic conditions

This category addresses 67 comments and questions on the accuracy or adequacy of the baseline geologic conditions at the Yucca Mountain site. Because of the large number of comments received in this category, and the variety of subjects that the category covers, it has been divided into five issues, as follows: (1) Regional Stratigraphy and Structure, (2) Site Stratigraphy and Structure, (3) Seismicity, (4) Mining and Mineral Resources, and (5) Miscellaneous.

Issue: Regional stratigraphy and structure

Twenty-two questions were asked relating to this issue. Many commenters contended that the draft Environmental Assessment (EA) did not adequately discuss either the regional fault zones in Nevada and southeastern California, specifically the Walker Lane and Las Vegas shear zones, or the structural deformation near these zones that has been triggered by nuclear explosions. A few commenters stated that the relationship between fault length and earthquake magnitude is a relatively reliable indicator of the expected size of future earthquakes. Statements in the draft EA were questioned regarding Quaternary fault displacements within 20 kilometers (12 miles) of Yucca Mountain as being represented by "... a few very small degraded scarps less than a meter or so in height." Also questioned was the statement that no "unequivocal" offsets younger than about 40,000 years old have been identified along faults near the site.

Several commenters questioned conclusions that volcanic and tectonic activity at Yucca Mountain and other parts of the Great Basin have decreased over the past 10 million years. Some commenters stated that the Basin and Range is geologically the most unstable region in the United States. Finally, the statement in the draft EA that most cores of mountain ranges are composed of granite and gneiss more than a billion years old was challenged by one commenter.

Response

A more detailed discussion of the fault systems in southern Nevada (particularly the left-lateral offsets throughout this region) has been added to the final EA. The intent of Chapter 3, however, is to provide the reader with a synopsis of the geologic setting of the region in which Yucca Mountain lies. Chapter 6 contains the details from which the descriptions in Chapter 3 were derived.

Many of the comments received, such as requests for more information on the regional stress regime, will be addressed during site characterization. Present information, however, indicates that explosion-induced aftershocks are all within about 14 kilometers (9 miles) of the detonation, whereas Yucca Mountain is more than 40 kilometers (25 miles) from the nearest underground tests. Figures contained in the draft EA have been updated on the basis of the most recent fault map of the Yucca Mountain area. This map, prepared by Scott and Bonk (1984), was unavailable when the draft EA was prepared.

It is true that the relationship between fault length and earthquake magnitude has been demonstrated for some earthquakes in the United States for which historic information exists. However, determining fault length for poorly exposed or relatively old faults is a subjective process and could lead to erroneous estimates of future earthquake magnitudes.

It is true that Quaternary displacements along the Bare Mountain Fault at distances greater than 20 kilometers (12 miles) from the site exceed 1 meter (3 feet). Although the statement in the draft EA is accurate, it could be misleading and has therefore been modified in the final EA. Several other text revisions in the final EA regarding fault displacements have been made on the basis of documents that were prepared concurrently with the draft EA. The statement in the draft EA regarding no "unequivocal" fault offsets younger than 40,000 years has been modified in the final EA to read "Where age constraints have been inferred from radiometric dating and from stratigraphic correlations of faulted and unfaulted deposits at a trenched site, no offset younger than about 40,000 years has been demonstrated. Holocene offset has not been demonstrated in the study area nor can it be ruled out." In addition, recently available but unevaluated thermoluminescence dates may indicate on the order of 1 to 10 centimeters (0.39 to 3.9 inches) of fault displacement in eastern Crater Flat more recently than 6,000 years ago (Dudley, 1985).

The text of the draft EA states clearly in several places that volcanism and tectonism have continued in south-central Nevada during the past 10 million years, but at a reduced rate compared to pre-10 million years ago. Many geologists have concluded that during the past 10 million years, volcanic and tectonic activity have gradually shifted toward the east and west margins of the Great Basin. Viewed as a whole, it cannot be denied that the Basin and Range is one of the most tectonically active regions in the United States, although parts of the Basin and Range, such as the Yucca Mountain region, have probably remained relatively stable for many millions of years.

The paragraph in the draft EA describing the core of mountain ranges and the age and extent of crystalline rocks has been modified in the final EA.

Issue: Site stratigraphy and structure

Sixteen comments were made regarding this issue. Most of the commenters stated that the discussion in the draft EA of the site geology omitted many topics such as a discussion of the northeast-trending faults at the site and slickensides found in a core at the site; conflicting data on the geologic history and stability of the site; the fractured nature of the rocks overlying the potential host rock in regard to possible venting of gases from the repository; the possible presence of low-angle detachment faults beneath Yucca Mountain; the degree of certainty associated with estimated fault displacements at the site; and the definition of a "moderately sized fault" as applied to the Ghost Dance Fault.

Other comments concerned inaccuracies in the description of the genesis of tuff at the site, and noted that the most recent references on calderas and caldera-forming eruptions were not used. Finally, a few commenters

claimed that the thicknesses reported in the draft EA for some formations were inaccurately reported from source references, and that Figure 2-3a (Schematic cross sections portraying the geologic complexity surrounding Yucca Mountain) in the draft EA should show the caldera in Crater Flat.

Response

The final EA contains the most current information on faults that may affect the construction and operation of a repository at Yucca Mountain. The source of this information is a map that was published by the U.S. Geological Survey (USGS) at the same time that the draft EA was issued (Scott and Bonk, 1984).

It is true that volcanism and faulting have continued at or near Yucca Mountain during the past 11 million years. The conclusion that the site is relatively stable on the basis of field evidence, however, is not inconsistent with the sentence above. Field evidence reported by Rogers et al. (1983) indicates that faults at Yucca Mountain have not had significant movement in at least the last 500,000 years, although the orientation of certain faults suggests that slip in the present-day stress regime is possible. Site characterization studies to be conducted at Yucca Mountain will investigate why faults have been stable for such a long period of time, and what the likelihood is that these faults will become active in the future.

The venting of gases described by one commenter has on occasion occurred shortly after nuclear explosions. Because a repository at Yucca Mountain would be located in the unsaturated zone, the possibility of vapor transport of waste elements exists. Only the noble gases such as xenon, krypton, or radon; carbon as carbon dioxide; tritium as H_2 gas or as water vapor; or iodine as I_2 vapor are possible waste elements that can be transported as gases or vapors. The aqueous phase in the unsaturated zone, however, can retard the movement of some of these waste elements because they are soluble in liquid water. Fractures in the rock above the repository horizon should have no bearing on the release of gaseous radionuclides from the repository principally because the waste will be sealed inside stainless steel waste disposal containers for hundreds of years. After about 300 years, most of the gaseous radionuclides will have decayed to nonradioactive products. This subject will be the object of intensive study during site characterization.

The possibility that low-angle detachment faults occur beneath Yucca Mountain will be investigated during site characterization. Because of the widespread occurrence of these structures in the Basin and Range, it would not be surprising if they were detected below Yucca Mountain.

The description of the Ghost Dance Fault has been modified in the final EA to reflect information that became available concurrently with the release of the draft EA. In brief, the Ghost Dance Fault dips steeply to the west, and has about 25 meters (82 feet) of displacement (USGS, 1984).

The description of the genesis of tuff and calderas has been modified on the basis of references suggested by the commenter.

Errors in the thicknesses of stratigraphic units have been corrected in the final EA. Illustration of an inferred caldera in Crater Flat on the cross section in Figure 2-3a (Schematic cross sections portraying the complexity surrounding Yucca Mountain) in the draft EA is inappropriate because the position, depth, and lateral extent of the Crater Flat Caldera are unknown. Illustration of an inferred caldera in the plan-view map on Figure 3-3 (Southern end of southern Nevada volcanic field showing location of calderas in the vicinity of Yucca Mountain) of the draft EA is shown with a question mark, indicating the uncertainties described above.

Issue: Seismicity

Fifteen questions were asked relating to this issue. Several commenters stated that seismic activity along the Pahranagat Shear Zone, and the Mine Mountain, Rock Valley, and Frenchman Flat fault zones (including focal depths), should be discussed in the final EA. Commenters questioned the U.S. Department of Energy (DOE) assumption that faults at Yucca Mountain are inactive and that the peak ground acceleration at the site is most likely to be 0.4g. A few commenters asked how the Walker Lane and Las Vegas shear zones could impact the project. Several commenters asked why the site was considered to be outside the bounds of the southern Nevada East-West Seismic Belt, and at the same time was included in a zone of "major seismic risk" on a map published by the USGS (1984). Finally, a few commenters questioned whether the design of structures at Yucca Mountain could withstand the maximum estimated earthquake in this area, and requested a discussion of what would happen to the surface and subsurface facilities in the event of a large earthquake. One commenter questioned the purpose of the dots on Figure 3-9 (Historical seismicity in the western United States) of the draft EA.

Response

The fault and shear zones mentioned in the comment are chiefly northeast trending, left-lateral fault zones of Tertiary age. In the preliminary calculation of maximum ground accelerations at Yucca Mountain from an earthquake, the fault zones noted in the comments were considered. However, the greatest impact on the site was predicted for the Bare Mountain Fault, which is approximately 6 kilometers (4 miles) closer to Yucca Mountain than the closest of the above-mentioned faults (USGS, 1984). Information on focal depths for recent earthquakes in this region is contained in a report by the USGS (1984).

Calculation of 0.4g as the probable peak acceleration at the site under the assumption that faults in the immediate vicinity of Yucca Mountain are not active is explained in the USGS (1984) report. This calculation required a listing of faults that were thought to present the greatest hazard to the site for which a reliable fault length could be estimated. Then, assuming a full-length rupture of these faults, the likely maximum magnitude for the earthquake was estimated from empirical relationships between fault length and earthquake magnitude. Peak accelerations at the site due to each event then were estimated using attenuation curves and the shortest distance to the site. This is the analysis that resulted in identification of the Bare Mountain Fault, as noted earlier in this section. Although current thinking

is that some faults in the immediate vicinity of Yucca Mountain are oriented so that slip is possible in the present stress field, the confidence in fault lengths is not sufficient to estimate magnitudes at this time. See Section C.8.4 and EA Section 6.3.3.4.5 for a description of the procedure to be followed to establish seismic risk for repository design purposes.

Possible earthquakes associated with the Walker Lane and Las Vegas shear zones will be evaluated quantitatively during site characterization. Additional information on regional and local seismicity from USGS (1984) has been added to Section 3.2.3 of the final EA. Carr (1984) suggests that activity along these zones has slowed considerably in the southern Great Basin during the past 10 to 14 million years.

It is true that the draft EA did not specify why Yucca Mountain was placed outside the southern Nevada East-West Seismic Belt. The placement of this boundary is very subjective and it has been removed from Figure 3-9 (Historical seismicity in the western United States) in the final EA. Calculations of maximum accelerations do not depend on a precise location of this boundary. The assignment by the USGS (1984) of this part of Nevada to a "major seismic risk area" represents a broad analysis of overall seismic hazards in the United States, including regions of very limited seismicity. The seismic hazards of small areas within broad high-risk areas also may be lower, as the data for Yucca Mountain thus far indicate.

The design of a repository at Yucca Mountain will require extensive studies and reviews with the Nuclear Regulatory Commission (NRC) to determine the appropriate seismic-design requirements for facilities in this region. The NRC has not yet written standards for the design of geologic repositories with regard to seismic considerations. Analyses of potential effects on preclosure repository operation and postclosure repository performance from earthquakes or faulting will be conducted during site characterization. The reader is also referred to Section C.8.4 for further discussions of tectonics considerations.

Figure 3-9 of the draft EA and the accompanying description have been modified to explain the dots, which indicate the centers of previous seismic activity.

Issue: Mining and mineral resources

Seven comments were made relating to this issue. Several commenters noted that mineral exploration has been banned at the Nevada Test Site (NTS) for the past 30 years. They indicated that an adequate evaluation of the mineral resources potential could, therefore, not be made solely with a literature review of past exploration and mining activities, such as Bell and Larson (1982). These commenters suggested that geochemical surveys should be conducted and that additional references should be cited in the EA. One commenter argued that there are insufficient data to conclude that Yucca Mountain does not contain commercially attractive geothermal resources. Finally, a few commenters pointed out that the Bare Mountain district, west of Yucca Mountain, contains the largest fluorite mine in Nevada, and that the gold reserve estimates for the Stirling-Panama mine reported in the draft EA are five times too small.

Response

The DOE is aware of the large mineral deposits west of the site in the Bare Mountain district. On the basis of current resource-accumulation models and the information currently available for Yucca Mountain, the site has a low potential for metallic mineral resources. This conclusion is based on the following information:

1. Mineral inventories were conducted by literature review (Bell and Larson, 1982) and by combined literature review and field investigation (Quade and Tingley, 1983). The results indicated that there is no evidence of past mining activity at Yucca Mountain nor any evidence of existing economic mineralization. A number of drill holes at and near the site support the conclusion of no economic mineralization. Results also indicated that there are no economically significant non-metallic mineral deposits located at Yucca Mountain.

2. Field exploration and geologic mapping was conducted by the USGS (Christiansen and Lipman, 1965; Lipman and McKay, 1965; Scott and Bonk, 1984) for Yucca Mountain and surrounding areas. No evidence of economic mineralization was reported or mapped.

3. Exploratory boreholes at and near the Yucca Mountain site have been drilled. Cores and cuttings derived from those boreholes are routinely analyzed by geochemical methods for the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. No mineralization has been found of economic importance. A sample from drill hole USW G-1 taken at 1,072 meters (3,515 feet) below the surface showed "... an abrupt increase in the intensity of alteration, presumably caused by hydrothermal solutions ..." (Spengler et al., 1981). An analysis of the sample showed that it contained 0.64 ounce per ton silver and 0.02 ounce per ton gold (reported as parts per million in the reference). These concentrations are not economical at the surface, let alone at a depth of 550 meters (1,800 feet) below the water table.

Drill holes at Yucca Mountain are up to 1,829 meters (6,000 feet) deep. Thermal gradients measured in these boreholes suggest that economically attractive (emphasis added) high-temperature waters are unlikely to occur at Yucca Mountain. Furthermore, geothermal systems that have some potential for development generally are associated with siliceous magmas (or their volcanic products) that are less than 2 million years old. The caldera systems at and near Yucca Mountain are between 11 and 15 million years old.

The final EA has been modified to acknowledge that widespread fluorite mineralization in the Bare Mountain district is judged to be of local significance (Bell and Larson, 1982). A reference supporting the comment that gold reserves at the Stirling-Panama mine are about 10,000 pounds has not been found; the final EA has been changed to read: "Reserves have not been reported by the mine operators of the Stirling-Panama mine, but Bell and Larson (1982) estimate ore reserves in excess of 100,000 tons at a grade of about 0.3 ounces of gold per ton of rock."

Issue: Miscellaneous

Seven comments were assigned to this issue. One commenter stated that there are substantial, though unstated, uncertainties in the quantitative models used in the draft EA to evaluate the suitability of the site, as well as uncertainties in the geotechnical data upon which these models rely. Not identifying these uncertainties, contend the commenters, leads to overly optimistic findings relative to the guidelines. Another commenter stated that heat-induced dehydration of zeolites was not discussed in Chapter 3 of the draft EA. A discussion of soil conditions was requested by one commenter, who argued that wind and water erosion are, in part, a function of soil type. Several commenters found typographical errors and errors in conversion from the English to the metric system. Finally, one commenter requested that a letter from URS/John A. Blume and Associates to Science Applications International Corporation, regarding the design and construction of nuclear facilities in tectonically active areas, be included in the references for the EA, and that a copy of the letter be made available to the State of Nevada for its review.

Response

A more complete consideration of uncertainties in geologic models and the information used to develop these models has been included in the final EA. In some cases where reasoned judgment and opinions were used, the text has been modified to indicate the subjectivity of the interpretations and the uncertainty of the opinions. It is noted, however, that by making conservative assumptions at several points in an analysis, the conservatism may in fact be multiplied several times, resulting in an overly pessimistic or unrealistic finding in regard to the suitability of the site for a waste repository.

Possible heat-induced dehydration of zeolites is described in Section 6.3.1.2 (Geochemistry). Chapter 3 discusses only the baseline geologic conditions at the site, not the effects that a repository may have on the rock.

Because of the arid climate and resultant low water availability in southern Nevada, soil development in this region has been limited. During site characterization, however, soil conditions will be studied for the purposes of siting the surface facilities and eventual reclamation. Studies to determine the potential effects of wind and water erosion will also be performed.

All errors pointed out by reviewers (typographical and conversions from the English to the metric system) have been corrected in the final EA. The letter referred to by the comment (from John A. Blume and Associates to Science Applications International Corporation) is not a reference and is therefore not included in the final EA. However, this letter has been made available to the State of Nevada.

C.4.1.2 Hydrologic conditions

Comments addressing hydrologic conditions were assigned to the categories of: (1) Surface Water, (2) Ground Water, and (3) Current Use, and are addressed below.

C.4.1.2.1 Surface water

This category addresses four comments on the accuracy or adequacy of the baseline surface-water conditions at the Yucca Mountain site. The comments were assigned to two issues: (1) Floods and Flood-plains and (2) Clarifications.

Issue: Floods and flood-plains

Two commenters stated that sheet wash and channel runoff can cause considerable damage to surface and subsurface facilities in the desert southwest and that these processes should be considered during siting of surface and subsurface facilities at Yucca Mountain.

Response

It is true that sheet wash and channel runoff can be expected during severe storms at Yucca Mountain. Each will be considered in the siting and design of the exploratory shaft and the repository. The maximum probable flood expected in this area will be determined during site characterization; this is the design flood to which American National Standards Institute standards will be applied in order that the repository and associated facilities may comply with safety standards as recommended by the Nuclear Regulatory Commission in Regulatory Guide 4.17 (NRC, 1982) or other requirements as established. Due to the potential for sheet wash, the potentially adverse condition related to flooding of the surface and underground facilities (Section 6.3.3.1) has been changed to present.

Issue: Clarifications

Two comments were made on this issue. One commenter argued that statements pertaining to internal drainage in the Great Basin are incorrect and cited the Colorado River as an example of external drainage. Also questioned were statements in the draft Environmental Assessment (EA) about the Great Basin's "limited agricultural potential." Finally, one commenter suggested that Figure 3-11 (Drainage basins in the Yucca Mountain area showing direction of flow of surface water) of the draft EA could be made clearer by minor editorial and drafting modifications.

Response

The Colorado River drains part of the Basin and Range province. Yucca Mountain, however, lies within the Great Basin, a segment of the Basin and Range defined as having internal surface drainage.

The potential for agricultural development in Nevada may be large assuming that sufficient amounts of water are applied to the land. It is true that crop yields for some crops in parts of Nevada have been large. However, because of Nevada's overall arid climate and relatively poor soil conditions, agricultural production has not been significant compared to many other parts of the nation.

The final EA includes the changes suggested for Figure 3-11 in Section 3.3.1 of the draft EA.

C.4.1.2.2 Ground water

This category addresses the accuracy or adequacy of the baseline ground-water conditions at the Yucca Mountain site. The 36 comments received were assigned to the following issues: (1) Direction of Ground-water Flow, (2) Ground-water Travel Time, (3) Recharge at the Site, (4) Ground-water Supply and Availability, and (5) Miscellaneous.

Issue: Direction of ground-water flow

Thirteen comments were made on this issue. Several asked the U.S. Department of Energy (DOE) to discuss in more detail ground-water movement through and between aquifers, along fault zones, and through interstitial pores. One commenter stated that fracture flow in the welded-tuff and lava-flow aquifers requires that zeolites be present along these fractures to retard migration of radionuclides; otherwise, bedded tuff would be more advantageous to use as a host rock.

Several of the commenters stated that there is an extreme lack of information about ground-water movement in the Basin and Range, especially the delineation of ground-water basins in southern Nevada and the relationship among these basins, the deep carbonate aquifer beneath Yucca Mountain, and the springs at Ash Meadows and Death Valley.

One commenter asked that the DOE discuss more fully the likelihood of discovering minor aquifers in the vicinity of the site and their relation to other aquifers in the area. Information was also requested regarding aquifer size, recharge rates, and production potential of all regional aquifers.

Other commenters requested that the DOE discuss vertical mixing among aquifers, in view of the possibility that the deep carbonate aquifer could be used as a water source in the future. Information was also requested on the potential to contaminate water in Well J-13 which could be the water source for the repository.

Finally, one commenter requested that the distance between recharge and discharge points be stated in the discussion in Section 2.1 of the draft Environmental Assessment (EA).

Response

The discussion of ground-water movement along faults at Yucca Mountain (Section 6.3.1.1) has been modified to be consistent with the exact wording in Montazer and Wilson (1984). Studies to date indicate that ground water beneath Yucca Mountain flows to the southeast and south and discharges at Alkali Flat, and possibly near Furnace Creek in Death Valley. This ground-water basin, referred to as the Alkali Flat-Furnace Creek Ranch ground-water basin, is thought to be separate from the Ash Meadows ground-water basin which supplies water to Ash Meadows.

The unit evaluation report (Johnstone et al., 1984) established that both zeolitized and non-zeolitized rock units considered as candidates for a potential host rock would be suitable. However, the greater distance of the Topopah Spring Member from the water table gives it an advantage in terms of travel time. It is also clear that the presence of zeolitized rock units below the repository horizon is an advantage when flow paths are likely to be oriented vertically downward.

Because hydraulic head pressure is higher in the carbonate aquifer than in overlying tuffaceous rocks (at least in Well UE-25p#1), water from the tuff aquifer cannot enter the carbonate aquifer. It is also stressed that the repository is above the water table. Much additional work will be conducted during site characterization to investigate if other aquifer areas occur. That fact, and the estimated ground-water travel time from the repository to the water table (even assuming it does occur; Section 6.3.1.1.5), would preclude contamination of water in Well J-13.

Minor aquifers or perched water tables do occur in the Yucca Mountain region. The water would be expected to drain rapidly during excavation. Moreover, it is highly unlikely that large aquifers remain undiscovered in and near the Nevada Test Site because of the extensive drilling programs that have been conducted in this region during the past several decades. A thorough summary of the known regional hydrology is presented by Waddell et al. (1984).

Approximate distances between recharge and discharge points can be estimated from Figure 2-5 (Location of Yucca Mountain site with respect to the basins of the Death Valley ground-water system), where the ground-water basins are illustrated schematically.

Issue: Ground-water travel time

Two comments were received on this issue. One commenter suggested that rapid water flow along fractures near the repository to wells in the region (if it occurs) could be determined by tritium injection and later water analysis. Another commenter suggested a modification to the executive summary in regard to ground-water travel time.

Response

Some tritium analyses have been conducted (Benson et al., 1983) and more will be conducted during site characterization using samples from well water and from any perched water zones found during construction of the exploratory shaft. Tritium injection plans remain to be finalized.

The Executive Summary has been revised to accurately reflect the information in the final EA.

Issue: Recharge at the site

Thirteen comments were received on this issue. Many commenters questioned the annual recharge rate at Yucca Mountain by noting that the available data base is inadequate to support the DOE estimated percolation of 1 millimeter (0.04 inch) per year. Some of these comments suggested that the uncertainty of these estimates be stressed in the final EA. Another commenter suggested that recharge along fractured tuffaceous rocks during intense storms could be very high.

Response

The estimate of flux at Yucca Mountain is not a direct measurement, since there is no water removal from drill holes within the unsaturated zone, as explained by Montazer and Wilson (1984). It was derived by measuring the in situ potential gradient and effective permeabilities from core samples and using these to estimate flux. Several tests are planned during site characterization to better understand infiltration and to determine the amount of flux in the host rock. Section 6.3.1.1.5 has been expanded to include a discussion on the range of flux rates that are considered reasonable at Yucca Mountain. In this regard, however, information from Czarnecki (1985), Rush (1970), and specifically Montazer and Wilson (1984) and Montazer et al., (1985) indicate that less than 0.5 millimeter (0.02 inch) per year is currently passing through the proposed repository host rock (the Topopah Spring Member).

Issue: Ground-water supply and availability

Two commenters questioned the production potential of the aquifers in the site area (including the deep carbonate aquifer) by noting that little information is provided on the potential future use of these aquifers for domestic and irrigation resources. Another commenter questioned why the DOE did not evaluate possible reductions in the discharge of water at springs in Ash Meadows that might be caused by repository development at Yucca Mountain.

Response

With regard to production potential, the final EA includes a discussion of the wells that are extracting water from the Alkali Flat-Furnace Creek Ranch ground-water basin. Much of the irrigation in the Amargosa Valley south of Yucca Mountain is provided by springs that discharge along or near faults that bring water from the deep carbonate aquifer to the surface. It does seem possible, however, that exploitation of deep aquifers throughout

Nevada could occur at some point in the future, assuming that the shallow aquifers are eventually depleted. The likelihood that the relatively small Alkali Flat-Furnace Creek Ranch ground-water basin would be exploited for its water will be evaluated during future studies.

With respect to Ash Meadows, it is correct that in Chapter 3 the DOE did not evaluate possible reductions in the discharge of water at springs in Ash Meadows caused by repository development at Yucca Mountain. This is because springs at Ash Meadows discharge from a different aquifer and could not be affected by activities at Yucca Mountain. Section 5.2.2 of the final EA, however, does describe the hydrologic impacts that could be expected from development of a repository at Yucca Mountain. Moreover, as stated in Section 5.2.2, "... the aquifers underlying Yucca Mountain can produce an abundant quantity of ground water for long periods of time without lowering the regional ground-water table ..." (Thordarson, 1983).

Issue: Miscellaneous

Six comments were received on this issue. One commenter stated that much of the information about the Alkali Flat-Furnace Creek Ranch ground-water basin is speculative because hydrologic testing will not begin until the site is already in the characterization stage. Thus, conservative ground water travel times for the site cannot be confidently estimated. Another commenter pointed out errors in the text of Chapter 3 concerning an historical review of ground-water studies in this area. Several commenters found an error in Table 3-3 (Dual classification of Tertiary volcanic rocks at Yucca Mountain) and on the identical Table 6-16 of the draft EA. A last commenter asked that the basins be referred to in terms of the Hydrologic Basins delineated by the State of Nevada Engineer.

Response

A major, regional ground-water study of the Yucca Mountain area has already been completed by Waddell (1982) and a summary of studies is given in Waddell et al. (1984) and the results are included in the EA. Although much has already been learned about the hydrology of Yucca Mountain, much more information will be gathered during site characterization. Ground-water travel times reported in the final EA reflect the range of uncertainty of the available data.

The comment about inconsistencies in the historical review of ground-water studies in this area is partly correct. Yucca Mountain was not placed within the Ash Meadows ground-water basin by Winograd and Thordarson (1975) as stated in the draft EA, but rather in their Oasis Valley-Fortymile Canyon basin. This has been corrected in the final EA. Basin designations were revised by Waddell (1982) and Yucca Mountain was placed in the Alkali Flat-Furnace Creek Ranch ground-water basin.

The reversal of stratigraphic order of the Pah Canyon and Yucca Mountain members in tables 3-3 and 6-16 of the draft EA has been corrected in the final EA. With regard to accurate designation, the one used by Waddell (1982) and Waddell et al. (1984) represents the most recent interpretation by the U.S. Geological Survey.

C.4.1.2.3 Current use

This category addresses comments on the accuracy or adequacy of the baseline conditions in the Yucca Mountain area concerning current water use. The 15 comments were assigned to the following issues: (1) Water Use, (2) Water Demand, and (3) Water Rights.

Issue: Water use

Six questions were asked on this issue. Several commenters stated that the U.S. Department of Energy (DOE) could have estimated water use (irrigation and domestic) in the Amargosa Valley by indirect methods, including LANDSAT images. Other commenters stated that up-to-date figures for water use in the Amargosa Desert ground-water basin (including the acreage under irrigation) are available from the State of Nevada. A few commenters stated that although the draft Environmental Assessment (EA) pointed out that the ground-water table in the Ash Meadows area has declined because of irrigation pumping, there is no discussion of the impact of the declining water table on the DOE proposed water supply for the repository. Moreover, there is no discussion of the impact to local water users from ground-water pumping at Yucca Mountain.

Response

Although various indirect methods for estimating water use in the Amargosa Valley could have been used, a study by the State of Nevada was selected. After the draft EA was prepared, a study of water use in the Amargosa Desert ground-water basin, as designated by the State Engineer, was issued by the Nevada Department of Conservation and Natural Resources (Coache, ca. 1984). The Amargosa Desert ground-water basin, as designated by the State Engineer, draws its water from the Alkali Flat-Furnace Creek Ranch ground-water basin, and from the Ash Meadows ground-water basin. Agricultural water use in the Amargosa Desert designated ground-water basin was estimated to be 9,105 acre-feet in 1983. Industrial, commercial, and quasi-domestic water use was estimated to be 1,070 acre-feet in 1984. From well log data, non-permitted pumping for domestic use is estimated to be 400 acre-feet per year (Coache, ca. 1984). Thus, the estimated water use in the Amargosa Desert designated ground-water basin in 1984 (assuming that agricultural water use was not significantly different from 1983 to 1984) was about 10,575 acre-feet. This information is included in the final EA.

Drawdown of the ground-water table discussed in Chapter 3 refers to the Ash Meadows ground-water basin. On the basis of current information, Yucca Mountain lies within a separate basin referred to as the Alkali Flat-Furnace Creek Ranch ground-water basin. Ground-water pumping at Yucca Mountain is therefore not expected to have any affect on water users in the Ash Meadows basin, nor will water use in the Ash Meadows basin have any affect on the water supply for the repository.

Issue: Water demand

Four questions were received in this area asking that the final EA consider various growth patterns in southern Nevada in terms of future water needs and potential utilization, especially considering that a future Las Vegas could obtain water from the lower carbonate aquifer near Yucca Mountain. Other commenters stated that because specific water requirements for the project were not included in the draft EA, potential impacts such as regional drawdown or contamination to future water supplies cannot be evaluated. Finally, one commenter stated that the title to Section 3.3.3 (Present and projected water use in the area) is misleading because there is no assessment of future water needs in this section.

Response

The ground-water basin in which Yucca Mountain lies is called the Alkali Flat-Furnance Creek Ranch ground-water basin and is relatively small; it ranges from approximately 32 to 64 kilometers (20 to 40 miles) in width and is approximately 161 kilometers (100 miles) long. Ground water discharges from this basin at Alkali Flat and near the Furnace Creek Ranch in Death Valley. All analyses to date indicate that part of the Amargosa Valley is in an adjacent basin known as the Ash Meadows ground-water basin. Ground waters in the two basins are not connected. Development and operation of a repository at Yucca Mountain is not likely to have impact on future developments in the Amargosa Valley. Furthermore, in 1979 the Nevada State Engineer designated, or formally recognized the presence of, the Amargosa Desert Ground-Water Basin (Newman, 1979), which placed issuance of new water permits on a preference basis rather than a prior-appropriation basis (Morros, 1982). Consumptive use of ground water for irrigation was ruled not to be a preferred use in this basin.

It is possible that an expanding population in southern Nevada may eventually exploit other ground-water basins in Nevada. It would be very unlikely, however, that future water needs for the City of Las Vegas would lead to exploitation of a ground-water basin as small as the Alkali Flat-Furnace Creek Ranch ground-water basin when basins that are larger and closer to Las Vegas are available.

Estimates of the water requirements for the repository are included in the final EA. A qualitative evaluation of water use in the Alkali Flat-Furnace Creek Ranch ground-water basin is included in the final EA by comparing the expected water use at the repository with other water users in this area. The DOE retains its preliminary conclusion that ground-water pumping at the repository will not cause a regional drawdown of the water table. This conclusion is based on records for 18 years of pumping of Well J-13, which is the well that is being considered as a possible water source for the repository (see Section 6.3.3.3). Additional studies conducted during site characterization will help predict future water demand in the Alkali Flat-Furnace Creek Ranch ground-water basin.

Issue: Water rights

Six comments were made on this issue. One commenter stated that because Yucca Mountain is not a Congressionally established "reservation," the final EA should contain a discussion of unappropriated water, citing that Nevada law requires the State Engineer to reject new applications for water rights for any purpose where there is no unappropriated water. It was also questioned whether the DOE has the necessary water rights for a repository at Yucca Mountain. Another commenter wanted to know if the DOE currently has water rights from Well J-13, and if so, what the limitations are on these rights.

Response

If it becomes necessary to acquire privately held water rights for the repository, a situation not expected based on available information, the DOE would purchase these rights or begin Federal condemnation proceedings. Such negotiations or proceedings are not expected or planned. Because no existing privately held rights or encumbrances have been identified at the site, the DOE considers that the qualifying condition has been met. Whether superior rights to the water in the same underground source exist with respect to points of extraction outside the Nevada Test Site has not yet been determined.

C.4.1.3 Environmental conditions

Comments addressing environmental conditions were assigned to the categories of (1) Land Use; (2) Ecosystems; (3) Air Quality and Weather; (4) Noise; (5) Aesthetic Resources; (6) Archaeological, Cultural and Historical Resources; and (7) Background Radiation. These subject areas are addressed below.

C.4.1.3.1 Land use

The baseline land-use section of the Environmental Assessment (EA) presents the existing situation in the region with respect to land use. Also presented is a discussion of projected developments in the area, based on available data and information. A number of comments were received in this category, and these have been aggregated to the following issues: (1) Land Withdrawal, (2) Agricultural Concerns, (3) Future Development, and (4) Mineral Resources.

Issue: Land withdrawal

Eleven comments were received on the issue of land withdrawal for the repository and railroad spur. Most commenters questioned the large amount of land to be withdrawn (50,000 acres), and requested information on how such a withdrawal would proceed. Some also asked that the area of land to be

withdrawn be illustrated. The same commenters also requested that the total required acreage for the repository be identified.

Response

The total required controlled acreage for the repository is 24,710 acres. This area includes Bureau of Land Management (BLM), Nevada Test Site, and Air Force lands. The BLM portion, which is the portion that would have to be withdrawn, is approximately 5,000 acres, not 50,000. The EA text has been corrected in several places to reflect this change.

At present a rail corridor through BLM lands is only one of three options being studied for the repository program. If a corridor were to be sited through BLM lands, the land may consist of a simple right-of-way rather than withdrawal of many acres solely for that purpose. Regardless, detailed studies of competing land uses will be done during site characterization and in conjunction with the Environmental Impact Statement process.

Issue: Agricultural concerns

Five comments addressed this issue. Several commenters claimed that the EA neglected to address the effects of the project on prime farmland or on farmlands of statewide importance. Another commenter noted that desert soils are among the most fertile soils and that productivity is limited primarily by the availability of water. Also mentioned was the possibility that Federal activities involving shipments of highly radioactive materials through the State of Nevada could result in the contamination (and therefore loss of use) of large tracts of range or agricultural lands.

Response

The Yucca Mountain site does not contain prime farmland or farmland of statewide importance as defined in the Farmland Protection Policy Act. Possible impacts to lands adjacent to transportation corridors are discussed in Section 5.3.2 of the EA. While it is true that water is the most limiting factor to desert land development, nutrient content of soil is also an important factor in agricultural land development. Since nutrient content at the Yucca Mountain site is low, these lands are not considered conducive to agricultural development.

Issue: Future development

Seven commenters addressed future development concerns, and asked that the EA discuss in greater detail topics such as State and local land-use regulations (regarding incorporation, annexation, zoning, flood plain control), infrastructure planning, construction design, and so on. Two of the commenters also asked that the EA include more information on the timing and size of sub-division developments planned for Ash Meadows and Pahrump Valley. A "future-oriented" water-use analysis related to projected developments was also requested.

Response

It is too early in the planning process to incorporate future developments, such as local subdivision expansion, and infrastructure data because the data will change in the next five years as the Environmental Impact Statement is developed and studies associated with it are implemented. Site characterization and repository activities will comply with all applicable State and local land-use regulations. Further, multiple-use priorities will decrease once the site becomes a controlled area.

Issue: Mineral resources

The discussion of land use for mining activities in the area of the site was considered inadequate by two commenters, since it refers only to the present condition, and does not address the future potential for mineral exploration and extraction.

Response

It is beyond the scope of this EA to predict future mineral exploitation; only the current situation can be described. At present, no economically exploitable resources exist in the Yucca Mountain area. A detailed discussion of the resource potential of the area is presented in Section 6.3.1.8 of the EA.

C.4.1.3.2 Ecosystems

The comments discussed in this category questioned the description of the baseline ecosystem and the description of the floral and faunal communities presented in the draft Environmental Assessment (EA). Five comments were received in this area, and they are subdivided into three issues: (1) Threatened or Endangered Species, (2) Revegetation, and (3) Mixed Transition Plant Association.

Issue: Threatened or endangered species

Three commenters expressed a concern that the threatened and endangered species listing cited in the EA was incomplete. Both the Mojave fishhook cactus and the desert tortoise were given as candidates for addition to such a listing.

Response

Information gathered during a literature review, during intensive site-specific surveys, and through discussions with the U.S. Fish and Wildlife Service indicated that no listed threatened or endangered species occur in the study area, and accordingly, Federal protection under the Endangered Species Act of 1973 (USFWS, 1973) is not appropriate in this area. Both the Mojave fishhook cactus and the desert tortoise are candidates under review but have not yet been officially added to the list of federally protected

species. Should their status change, the DOE will take the appropriate steps required under the Endangered Species Act. The desert tortoise is also a State-protected, "rare" species. The text in Section 3.4.2.3 of the final EA has been revised to indicate the above condition.

Issue: Revegetation

One commenter questioned how much "organic activity" would be contained in topsoil that was disturbed and banked for 25 to 30 years.

Response

Topsoil that is removed during site characterization will not be banked for 25 to 30 years; rather, it will be stored only for the short amount of time that an exploratory hole is in operation (all site characterization activities are to be completed within 4 to 5 years), and then used for the reclamation and restoration of exploratory holes. Longer-term revegetation procedures for the repository will be investigated during site characterization. "Organic activity" of soil may be measured in several ways. All soil, whether disturbed or undisturbed, undergoes aging and chemical transformations. It is not anticipated that soil banking will significantly affect the potential of the banked soil to be used in reclamation activities.

Issue: Mixed transition plant association

One commenter noted that the description of the mixed transition plant community was described only in terms of absent species, and that the description would benefit through the inclusion of dominant species names, general description of the community, and reference to bordering communities and associated transitional zones.

Response

The text of Section 3.4.2.1.4 of the final EA has been changed to provide a more detailed description of this community. However, because of the highly variable nature of the plant association, it is difficult to describe or quantify it in exact terms.

C.4.1.3.3 Air quality and weather

The 13 comments that address this category have been divided into four issues: (1) Meteorological Data Collection, (2) Precipitation and Evapotranspiration, (3) Climate, and (4) Fugitive Dust.

Issue: Meteorological data collection

Four commenters questioned the adequacy of the baseline data base for meteorological and air-quality conditions in and around the proposed repository site. For example, it was felt that not enough information was

provided on diffusion climatology and potential ambient air-quality levels in the area of the Yucca Mountain site. It was further suggested that information on wind speed, wind direction, atmospheric stability, and interference with national ambient air-quality standards be provided. As a consequence, the text of these comments also questioned the evaluation of the effects on air quality from such things as the release of radionuclides.

Response

The baseline evaluation and description of meteorological conditions presented in the draft Environmental Assessment (EA) were based on data from sites around the proposed repository site because site-specific data were not available. The onsite program was initiated by Sandia National Laboratories to aid in the design of heating and air conditioning systems for the surface facilities, not to provide the data required to adequately assess diffusion climatology at the site. Furthermore, the data collected by Sandia were not available in a referenceable form.

The air-quality analysis presented in Chapter 5 of the draft EA specifically excluded radionuclide emissions and their subsequent impacts. Radiological impacts are discussed in sections 5.2.9 (Radiological effects) and 6.4.1 (Preclosure radiological safety assessments) of the draft EA. These impacts, however, are not compared to limits set forth in 40 CFR Part 61 because Subpart H of 40 CFR Part 61 excludes the U.S. Department of Energy facilities that are regulated under 40 CFR Parts 190, 191, or 192. The repository at Yucca Mountain would comply with conditions set forth in 40 CFR Part 191 (Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes, 1985), rather than 40 CFR Part 61.

Environmental documents published subsequent to the EA, such as the Environmental Impact Statement (EIS), will evaluate in detail the impacts associated with the various aspects of development of Yucca Mountain as a repository. At that time, impacts due to waste transportation and commuter traffic and potential interference with attainment of national ambient air-quality standards will be evaluated in greater detail. Presently, the collection of data on transportation routes, transportation modes (truck, train, or both), and several other aspects of the project have not been completed. Additionally, complete onsite meteorological and air quality data will be available at the time the EIS is prepared.

Issue: Precipitation and evapotranspiration

Four commenters questioned the annual average evapotranspiration and precipitation rates presented in the EA, and the statement in the EA that annual precipitation averages one-third of evapotranspiration. Postulated extreme event and antecedent moisture conditions were thought to be more meaningful than average precipitation and evapotranspiration.

Response

Records for Yucca Flat show monthly data as well as annual averages so that variability in moisture conditions can be predicted. For climate and air-quality modeling that will be part of site characterization, additional

site-specific meteorological data will be available, and details of annual variations in precipitation and evapotranspiration will be understood. General understanding of these values for the arid southwestern United States will also be useful for comparing site data and improving predictive capability.

For the draft EA, potential evapotranspiration was estimated by an empirical method (the Thornthwaite method) reviewed by Rosenberg (1974). Potential evapotranspiration for Yucca Mountain has been estimated to be about 0.6 meter (2 feet) per year. No reference was cited for the evapotranspiration value contained in the comment. Estimates in Craig and Robison (1984) suggest 1 to 1.5 meters (3.5 to 5 feet) of potential evapotranspiration. The U.S. Geological Survey, in its comments on the draft EA, states that potential evapotranspiration is between 1.3 and 2.4 meters (6 and 8 feet) per year. Either of these estimates is consistent with the estimates of precipitation that are 20 percent or less of annual potential evapotranspiration as reported at the end of Section 6.3.1.1.3 of the draft EA. These estimates are preliminary and speculative, and the final EA has been revised to reflect this uncertainty. The climatic regime will be studied in more detail during site characterization.

The EA was modified to reflect new studies by Claassen (1983) which suggest that infiltration may be limited to pluvial and near-pluvial conditions and that current recharge is very limited, even at higher elevations.

Issue: Climate

Three commenters addressed the adequacy of the data presented in the draft EA and the validity of the interpretation of that data in accurately assessing long-term climatic effects on the repository. Extrapolation of climatic conditions at Yucca Flat to higher elevations at Yucca Mountain were not considered appropriate.

Response

A review of alternative interpretations of Pleistocene climates has been added to the final EA. An indication of the points for which agreement has been reached, or where there is no consensus among recognized experts, has been included to provide balance to the discussion of paleoclimates. If Yucca Mountain is selected for further consideration as a repository, data needed to fully characterize the diffusion climatology and meteorology of the site will be collected during site characterization.

Issue: Fugitive dust

Two commenters expressed concern that the baseline meteorological and air quality conditions at the site were such that development activities associated with the repository (clearing of land, travel over unpaved roads) would reduce the effectiveness of particulate-control strategies (e.g., the aridity of the area would make watering unpaved roads for dust control impractical).

Response

Although the climate of the area could require that special consideration be given to control strategies proven effective in similar meteorological conditions, the inherent weather conditions would not prevent reasonable, effective particulate control. Watering not only controls the dust as long as the surface is wet, but also helps in compacting loose particles and cementing them into the surface as it dries. It also washes fine particles (which are more likely to be suspended) down into the road surface. Commercially available dust-control chemicals can be mixed with the water to aid in more thorough wetting of the surface and to inhibit particulate emissions.

C.4.1.3.4 Noise

This category concerns the data on existing noise conditions presented in Chapter 3. The one comment received in this category asked whether the ambient noise levels estimated in the draft Environmental Assessment (EA) for rural communities and desert areas will be confirmed.

Response

The only way in which the estimated ambient noise levels presented in the EA can be confirmed is through a monitoring program. The conduct of such a program is outside the scope of activities allowed during the assessment of existing information about Yucca Mountain.

The subject of ambient noise levels will be addressed during the Environmental Impact Statement process, and a decision will be made as to the type and extent of studies to be conducted. If monitoring is deemed necessary, a plan will be developed at that time.

C.4.1.3.5 Aesthetic resources

This category concerns the data on existing aesthetic resources presented in Chapter 3; one comment was received. The commenter questioned if more discussion should be provided on visibility and if a view-shed analysis should be performed.

Response

The final Environmental Assessment was changed to explain that some facilities may be visible from U.S. Highway 95, especially at night when facilities are lighted. Additional visibility and view-shed analyses may be conducted during the Environmental Impact Statement process.

C.4.1.3.6 Archaeological, cultural, and historical resources

This category addresses the baseline description of archaeological, cultural, and historical resources found in the vicinity of the proposed study area of Yucca Mountain. The 15 comments were grouped into the following issues: (1) Sufficiency of Data, (2) Consultation with Other Organizations, (3) Site Comparison, and (4) Bibliography.

Issue: Sufficiency of data

Seven comments were received which pointed to a perceived lack of data in several areas. First, it was felt that the final Environmental Assessment (EA) should reference the planning and procedural steps of legislative mandates in the compliance process and should discuss the results of 1984 test excavations (including methodology and intensity level). This and other comments asked that the significance of the sites and their eligibility for listing on the National Register of Historic Places be presented in the final EA. In a related observation, one commenter suggested that the EA describe all site significance with reference to the Archaeological Element for the Nevada State Historic Preservation Plan (1982). Another commenter was concerned that the Tule Springs Archaeological District was not mentioned in the EA. Finally, it was requested that historic cultural resources be discussed in greater detail.

Response

With respect to the archaeological sites surveyed in the area, a table has been prepared and added to the text of the EA (Section 3.4.6) which lists all sites and their eligibility status. The Tule Springs site is indeed cited in the referenced report, contrary to the commenter's impression.

Field survey methodology and survey intensity have been outlined in specific technical reports and are not considered appropriate for inclusion in the EA. However, Section 3.4.6 of the EA has been amended to reference the Nevada Historic Preservation Plan (1982).

Issue: Consultation with other organizations

Five comments were received under this issue; all addressed or requested that consultation procedures with other organizations be initiated as soon as possible. These organizations are as follows: the National Park Service (Western Region), the Nevada State Historic Preservation Office (SHPO), the Advisory Council for Historic Preservation, and Native American groups. The U.S. Department of Energy (DOE) was asked to coordinate with the State Department of Conservation and Natural Resources on the number of test units to be placed in each site, and on the site survey selection itself.

Response

This concern will be addressed by the establishment of a Programmatic Memorandum of Agreement between the DOE, the Nevada SHPO, and the Advisory Council on Historic Preservation. Such a Memorandum of Agreement will also prevent future disagreements on site selection and site survey procedures. With regard to Native Americans, no affected Indian Tribe has been identified

at the site; however, should such an identification be made, the appropriate Tribal Council will be contacted, advised, and consulted. In addition, archaeological reports prepared under the auspices of this project will, whenever possible, be sent to the National Park Service as requested.

Issue: Site comparison

One commenter noted that the number and type of prehistoric sites in the Yucca Mountain vicinity suggest that the area has experienced more than casual or transient occupation. The commenter requested that the type and quantity of archaeological findings on and near Yucca Mountain be compared with those of other areas of the State.

Response

Yucca Mountain was probably never heavily occupied, as its archaeological record reflects the remains of nomadic hunters and gatherers who rarely stayed very long in any one area. Archaeological site density at Yucca Mountain is greater than that recorded for the Yucca Flat area, situated 48 kilometers (30 miles) northeast of Yucca Mountain (Reno and Pippin, 1985), but is much less than that recorded for the Pahute and Rainier Mesa areas, situated 48 kilometers (30 miles) to the north (Pippin, 1986). Regardless of the specific site density, the archaeological record at Yucca Mountain does have the potential, as outlined in the EA, to address questions important in understanding the prehistory of Nevada.

Issue: Bibliography

Four commenters filed questions regarding the bibliographic record; the first noted that it seems as if very little in the cited literature was derived from historical sources. Another identified a reference that was cited in the text, but not found in the bibliography (Pippin and Zerga, 1983). The last commenter asked that a specific report be cited in the bibliography.

Response

Historical references are noted in Section 3.4.6 of the final EA, and the Pippin and Zerga (1983) reference is included in the final EA bibliography. The last report requested is an unpublished report prepared for the DOE, Nevada Operations Office, by URS/John A. Blume and Associates (Kensler, 1981). It is entitled "Survey of Historic Structures; Southern Nevada and Death Valley." It is important to note that this last report concentrated only on standing historic structures that had been previously recorded and did not involve cultural resource surveys. Other historical assessments of the region are underway. It has been reviewed during preparation of the final EA.

C.4.1.3.7 Background radiation

The comments in this category concern the background radiation data presented in Chapter 3. Seven comments were received. Five commenters noted

that the site may already be unsafe due to radiation in the soil from nuclear weapons testing. Another commenter questioned the definition of background radiation levels. The levels of radioactivity in Yucca Mountain ground water were also questioned.

Response

At present, the Yucca Mountain site is deemed to be uncontaminated from Nevada Test Site (NTS) activities. However, the contribution of NTS activities to the baseline radiation environment will be determined during site characterization. Soil will be tested for contamination. Workers would not be allowed in areas where contamination levels exceed applicable standards unless stringent precautions were used (e.g., protective clothing and monitoring).

In the context used here, radiological background refers to the baseline radiological conditions resulting from all sources (i.e., artificial as well as natural). This includes penetrating radiation from the earth's crust and cosmic sources, primordial radionuclides and their decay products, and radioactivity deposited in the area from previous activities at the NTS or from atmospheric nuclear testing on a global scale.

The level of radioactivity in Yucca Mountain ground water will be determined during site characterization. The general ground-water flow pattern is illustrated in Figure 6-2 (Maps of the Yucca Mountain site) of the draft EA. The flow tends to be toward the south or southeast under Yucca Mountain. No radionuclides other than tritium were present in detectable concentrations in NTS wells. The "other radionuclides" mentioned in the draft EA were measured in wells in New Mexico as part of the Environmental Protection Agency's off-site monitoring program for formerly utilized underground test areas. The text has been revised to specify tritium as the only detectable radionuclide in NTS wells.

C.4.1.4 Transportation

Twenty-seven comments were received in the transportation category and these were divided into the following issues: (1) Highways, (2) Railroads, and (3) Miscellaneous.

Issue: Highways

Ten comments were assigned to this issue. More specific existing and projected local highway data for communities in Clark and Nye counties, regional data for Nevada, and interstate data were requested. Two commenters suggested that the many trucks coming into Nevada would greatly increase the chance for an accident, and asked what provisions had been made for scheduling regular driver stops, and for accommodating unscheduled stops due to weather or other emergency conditions. Another commenter requested more traffic count data for U.S. Highway 93 to Arizona, Interstate 15, and local roads. One commenter asked why Table 3-8 (Traffic service levels and characteristics) was included in the draft Environmental Assessment (EA). In a related comment, it was asked whether project-related studies will consider

the cumulative effect that growth in outlying areas may have on the existing transportation network. Another commenter asked if any consideration had been given to providing access to Yucca Mountain through the northeast side of the Nevada Test Site (NTS), thus allowing more repository and workers to reside in Lincoln County.

Response

The request for more site-specific data will be addressed in the Environmental Impact Statement. Site-specific data will be provided for each proposed and alternative road and rail route. The U.S. Department of Energy (DOE) will comply with all applicable laws, regulations, and codes pertaining to the shipment of radiological and nonradiological materials. A brief overview of such regulations is contained in Appendix A of the final EA. Some additional specific data along postulated regional routes is provided in Chapter 5 of the final EA.

The comments on Chapter 3 concerning impacts and mitigation were addressed in Chapter 5 and Appendix A of the draft EA. Regardless, it must be emphasized that transportation impacts and mitigation will be evaluated in the Environmental Impact Statement. This will include the concern regarding growth in outlying areas and subsequent strain on the existing transportation network.

The trucks that bring waste to Nevada would increase the chance for an accident. Section 5.3.2 of the draft EA provides an accident-risk analysis, based on the methodology described in Appendix A. More traffic count data for local communities, U.S. Highway 93, and Interstate 15 were not provided because Chapter 3 was to focus on areas of potential maximum impact (U.S. Highway 95) to the site. Table 3-8 was included in the draft EA to provide a better description of different service levels and to provide criteria by which to judge the information provided in Table 3-9 (Evening-peak-hour (5-6 p.m.) traffic patterns on U.S. Highway 95, 1982) of the draft EA.

A formal transportation plan will be developed as site characterization and environmental impact studies progress. When final routing is selected, this transportation plan will include information regarding scheduled rest stops, and stops due to unexpected conditions such as weather.

With regard to access through the northeast side of the NTS, such a route would be impossible to establish, since this portion of the NTS is a restricted area which cannot accommodate pass-through traffic.

Issue: Railroads

Fourteen comments were assigned to this issue. A few commenters asked for the location of Dike Siding and the location of the railroad near the Desert National Wildlife Refuge. Several commenters requested more railroad information for such parameters as operation management plans, Federal and State regulations, rail routes, disaster insurance, accident risks, and existing arrangements. Other commenters questioned the extent and adequacy of the tests that the Union Pacific Railroad must meet to be a Class A main line.

Response

A better description of the location of Dike Siding may be found in Section 5.1.1.4.2 of the final EA. Figure 5-2 (Proposed highway and rail access routes to the Yucca Mountain repository) of the draft EA shows the proposed railroad more clearly. The railroad will not cross the Desert National Wildlife Refuge. Therefore, Corn Creek Springs and the Pahrump killifish will not be affected.

More railroad operation, infrastructure, and usage information will be provided in the Environmental Impact Statement. In addition, rail regulations and routing are discussed in Appendix A of the final EA.

The tests resulting in the Union Pacific Railroad main line through Las Vegas being classified as Class A are not relevant to the discussion in Chapter 3. The classification system will be reviewed during the Environmental Impact Statement process.

Issue: Miscellaneous

Three comments were assigned to this issue. One commenter suggested that the draft EA did not fully recognize North Las Vegas. Another requested the written communication from the Union Pacific Railroad noted in Table 3-10 (Recent railroad-traffic patterns) of the draft EA. A third commenter cited a typographical error in the EA text.

Response

The DOE recognizes North Las Vegas as a city but to simplify the many figures, the title "Las Vegas" serves the entire Las Vegas metropolitan area. The written communication from the Union Pacific Railroad noted in Table 3-10 (Recent railroad-traffic patterns) in Section 3.5.2 of the draft EA has been cited in the final EA and included in the references. The typographical error has been corrected.

C.4.1.5 Socioeconomic conditions

The U.S. Department of Energy (DOE) received many comments on the adequacy and accuracy of the draft Environmental Assessment (EA) description of baseline socioeconomic conditions in southern Nevada. Responses to comments on specific issues in the areas of economic conditions, population, community services, and government and fiscal conditions are in sections C.4.1.5.1 through C.4.1.5.5. Twenty-eight general questions were received on the scope and quality of the socioeconomic baseline description. These 28 general comments are grouped into four issues under this section: (1) Overall Approach, (2) Exclusion from Baseline Descriptions, (3) Native Americans, and (4) Statewide Concerns.

Issue: Overall approach

Four commenters felt that the information contained in the draft EA reflected haphazard data collection and generally poor data integration and

analysis. In particular, it was felt that the information provided in Chapter 3 of the EA on background social and economic conditions in Clark County suffered from a lack of detail and analytical depth. References were cited as missing and the way in which specific numbers were developed was unclear. Some information was referenced as having been obtained from newspaper articles, and the feeling was that newspapers should not be used as primary sources of information. Finally, the validity of using various years in the 1980s (rather than census years 1960, 1970, and 1980) to establish a socioeconomic baseline was questioned.

Response

The focus of the socioeconomic data-gathering effort was on information necessary to evaluate the Yucca Mountain site against the socioeconomic-related siting guidelines. Thus, data collection, although not comprehensive, was certainly not haphazard. Also, the purpose of Chapter 3 was to present background data which were used in the actual analyses presented in chapters 4 through 6. The final EA has been revised in a number of places in order to show more clearly how various data were obtained and analyzed. In addition, newspaper references have been deleted in those places where alternative information sources were available. However, newspaper references have been retained in cases in which their main purpose is to help the reader understand a community better.

An advantage of using the decennial census as a data source is that those data constitute an internally consistent and highly credible information base. A major disadvantage of using census data is that they are generally available only every ten years. In preparing the EA, the DOE did not rely solely on census data because timeliness of information is important in understanding the characteristics of a rapidly growing region such as southern Nevada. An evaluation of the requirements for additional socioeconomic data will be an important part of the investigations to be conducted if the Yucca Mountain site is approved for site characterization.

Issue: Exclusion from baseline descriptions

The DOE received 16 comments which pointed out that the draft EA did not discuss socioeconomic conditions in Lincoln County and the City of Caliente, despite the possibility that waste shipments by rail would pass through the county. Also, it was stated, individual communities in Clark County were not described in sufficient detail to enable an accurate portrayal of the county as a whole. For example, the statement that Las Vegas is an "adult community" was used to characterize Clark County, ignoring differences among communities. For example, it was pointed out that the city of North Las Vegas was not identified on any of the EA maps of the area of interest.

Response

Since actual transportation routes have not yet been identified, communities that could be affected by transportation of high-level radioactive waste have not yet been identified. If a repository were located at Yucca Mountain, social and economic impacts would occur in areas where repository-related expenditures would be made and where the inmigrating repository-related work force would reside. To the extent that resources are available

at competitive prices, it is expected that the majority of repository-related expenditures would be made in Nye County, where the site is located, and in neighboring Clark County, the major metropolitan area in southern Nevada. The Nevada Test Site (NTS), adjacent to the Yucca Mountain site in Nye County, employs DOE and contractor personnel with skills similar to the construction and mining skills which would be required by the repository work force. Historical settlement patterns of workers at the NTS provide a reasonable indication of where repository workers and their families would settle. Recent settlement patterns of these NTS workers were analyzed using their ZIP codes. The results of this analysis were summarized in Table 5-26 of the final EA. This analysis indicated that most (96 percent) of the NTS workers reported ZIP codes in Nye and Clark counties in 1984. The socioeconomic baseline conditions presented in Section 3.6 of the EA focus on this bicounty area, where almost all of the Yucca Mountain work force would be expected to settle. However, since the data summarized in Table 5-26 of the final EA also indicate that about 1.5 percent of the recent NTS workers reported ZIP codes in other Nevada counties (Douglas, Lander, Lincoln, Lyon, White Pine, and Carson City, a consolidated municipality), the DOE intends to consider a larger geographic area in future studies, if the Yucca Mountain site is approved for site characterization.

As is discussed in Section 6.2.1.7.3 of the draft EA, the favorable conditions of the socioeconomic impacts siting guideline were evaluated at the county level. The first potentially adverse condition (Section 6.2.1.7.4) was evaluated at the community level. As is explained in Section C.7.4 of this Appendix and Section 6.2.1.7.4 of the final EA, population growth rates were used as measures of impacts on community services, housing supply and demand, and the finances of State and local government agencies. Insufficient information was available from published sources to perform detailed community-specific analyses. Information on community services in individual Clark County communities is presented throughout Section 3.6.3. The statement (in Section 3.6.3.1 of the draft EA) that Las Vegas is primarily an adult community was not intended to characterize Clark County as a whole. In order to correct the impression of unwarranted generalization, the statement was deleted from the final EA. Figure 3-21 of the draft EA (Bicounty area surrounding the Yucca Mountain site) was revised to show the location of North Las Vegas.

Further research at the community level would be undertaken if the Yucca Mountain site is approved for site characterization.

Issue: Native Americans

Six comments were received which stated that the document fails to consider potential repository impacts on Native American communities. The commenters suggested that the Moapa River Paiute Reservation and the Las Vegas Paiute Tribe will be directly and significantly impacted by the transportation of waste, both by rail and by road. The draft EA was also thought to be silent regarding the wider range of Native American issues and potential conflicts. A commenter noted that the Western Shoshone continue to claim the land upon which the repository is proposed to be built, and contend that there is no consideration in the EA of present-day Indian concerns such as cultural persistence, quality of life, anthropological issues, and Indian religious freedoms.

Response

Native Americans in southern Nevada have not been certified as "affected" tribes within the meaning of the Nuclear Waste Policy Act (NWPA, 1983). A petition for certification under Section 2(2)(B) of the Nuclear Waste Policy Act was denied the Moapa Band of Paiutes (Frit, 1984). Therefore, Native Americans have not been singled out for special analysis in the EA.

In preparing the draft EA, the DOE was aware of Shoshone claims to the land upon which the repository is proposed to be built. However, the land claim issue was not addressed in the EA because of the Federal Government's position that the Shoshone had no legal right to the land. This position was sustained by a recent U.S. Supreme Court decision which effectively extinguished the Western Shoshone claim of aboriginal title to much of Nevada, including the Yucca Mountain site (United States v. Dann and Dann, February 1985). Two additional comments that voiced similar concerns regarding Native Americans were included in Section C.4.1.5.4.

American Indian reservations, being relatively distant from the Yucca Mountain site, are not expected to be affected significantly by the inmigration of repository-related workers and their dependents. The EA has been revised to include more detail regarding the number of American Indians residing on reservations in the bicounty area and the location of these reservations relative to the Yucca Mountain site. Specific note was made in Section 5.4.4.2 of the draft EA of the potential for impacts on Native American cultures from transportation activities. If the Yucca Mountain site is approved for site characterization, this aspect will receive appropriately detailed treatment in research to be performed during the Environmental Impact Statement process. In addition, the potential impacts of the repository project on Native Americans who live outside of reservations (as well as on other cultural groups in southern Nevada) would be the subject of detailed, community-level data gathering and analysis if the Yucca Mountain site is approved for site characterization.

Issue: Statewide concerns

Two commenters suggested that it may be useful to define the entire State as the "site" for the purpose of socioeconomic analyses. Broad, statewide conditions which should be described include the overall character of the State economy, the relationship of various sectors of the social and economic fabric of the State to counterpart components at the county and local levels, and the relationship of State government and finances to local and county governments. Social and economic analyses pertaining to areas of the State outside the bicounty area were thought by some commenters to be missing entirely from the draft EA.

Response

One of the functions of the EA is to support the evaluation of the siting guidelines. In neither of the guidelines which address population and other socioeconomic issues (10 CFR 960.5-2-1 and 10 CFR 960.5-2-6) is there a requirement to evaluate impacts at the level of a state. Indeed, for the

qualifying condition, favorable conditions, and potentially adverse conditions under the guideline on Socioeconomic Impacts (10 CFR 960.5-2-6), the DOE is to address potential impacts on and in "the affected area," which has been defined as Clark and Nye counties (as noted previously, in the issue regarding exclusion from baseline description, the analysis focused on those two counties, where about 96 percent of the repository-related workers and dependents are expected to reside). The State would, however, be an important unit of analysis in future investigation of socioeconomic impacts, if the Yucca Mountain site is approved for site characterization.

C.4.1.5.1 Population density and distribution

Three comments addressed population density and distribution. One commenter requested more detailed information to assess the validity and accuracy of the population forecasts presented in the Environmental Assessment (EA). Another stated that a more thorough discussion of the reasons for the recent growth of Nye County population and projections of future growth are necessary. One comment was received which requested more information on average commuting distance, modes of travel during commuting, average hours per day spent in commuting, and commuting information for other (i.e., non-Federal employment.

Response

It is true that an understanding of the reasons for recent and forecast population growth will be important to the future and more detailed assessment of social and economic impacts of locating a repository at Yucca Mountain if the Yucca Mountain site is approved for site characterization. It is not true that such a discussion is necessary to the analysis appearing in the EA. The Nye County population forecast presented in Section 3.6.2.2, Table 3-15 (Population of Nye County 1970-2000) of the final EA, is the most recent available forecast for that county. It was developed in 1984 by the Bureau of Business and Economic Research (University of Nevada, Reno) for the State of Nevada. That forecast will be out of date by the time that an Environmental Impact Statement would be prepared for the Yucca Mountain site. Thus future studies will necessarily address the reasons for growth and projected growth in the area. More information on the population forecasts appearing in Chapter 3 of the EA may be requested from the Nevada Office of Community Services.

Inclusion of more detailed information on commuting patterns would not contribute significantly to the analyses described in chapters 4 through 6. Additional research on worker settlement patterns would, however, be conducted if the Yucca Mountain site is approved for site characterization.

C.4.1.5.2 Economic Conditions

Twenty-seven comments addressed economic conditions. Responses were divided into six issues: (1) General Employment, (2) Nye County Employment, (3) Tables 3-11 and 3-12 of the draft EA, (4) Industrial Employment Sector Percentages, (5) Clark County Employment Growth Rates, and (6) Miscellaneous.

Issue: General employment

Two commenters asked for a reference date for the reported employment of 121,000 persons in the hotel, gaming, and recreation sector. Secondly, it was questioned why mining was not included under "other key employers" in Section 3.6.1 of the draft Environmental Assessment (EA), even though the mining industry makes a significant dollar contribution to the State of Nevada.

Response

The EA has been revised to show that direct wage and salary employment in the hotel, gaming, and recreation industry in Nevada was about 120,000 in 1983.

The mining sector was not mentioned in the discussion of key employers since it has the smallest number of employees of any sector in Nevada (State of Nevada, ESD, 1986). However, Section 3.6.1 of the final EA has been revised to discuss the importance of the mining industry to the State economy. Mining activities are important in the analysis of the employment impacts of the repository discussed in Chapter 5.

Issue: Nye County employment

Eight comments were assigned to this issue. Four commenters noted that Section 3.6.1.1 of the draft EA says that there were 7,508 workers in Nye County, while Nevada Employment Security Department (ESD) records place 1982 employment at 8,640 jobs. Furthermore, they noted that the EA states that 80 percent of the industrial employment was in mining, service, or government while ESD records show 87.6 percent. Three commenters also noted that the EA characterizes construction as a "large employer" in Nye County, while according to ESD administrative data, construction ranked seventh and represented 1.3 percent of industrial employment in the County in 1983. Three commenters noted that employment data for Nye County are presented for various years; this was considered confusing. Lastly, one of these commenters felt that the EA should describe historical Nye County agricultural employment in greater detail.

Response

The EA was revised, using the ESD data, to indicate that 89 percent of the 8,630 nonagricultural wage and salary jobs in Nye County in 1983 were in the mining industry, service industry, and civilian government. Since 1983 is the most recent year for which ESD data are available for both Clark and Nye counties, the EA was revised to show 1983 ESD data wherever the most recent values for wage and salary employment are discussed.

While employment in the construction sector is small, the construction sector is nevertheless important in the analysis of the employment impacts of a repository. Furthermore, according to ESD data, construction employment in Nye County has fluctuated considerably, and has represented as much as 5 percent of the total wage and salary employment in recent years (State of Nevada, OCS, 1985).

With respect to the confusing presentation of Nye County employment data, the EA was revised to clarify that ESD nonagricultural wage and salary employment data are used to show actual Nye County employment in 1980 and 1983 and that Bureau of Economic Analysis (BEA) OBERS data were used for employment projections. (See Table 3-12 of the final EA.)

The U.S. Department of Energy (DOE) felt that the provision of greater detail concerning historical agricultural employment in Nye County would not contribute to or affect the impact analyses presented in chapters 4 through 6.

Issue: Tables 3-11 and 3-12 of the draft EA

Seven comments were assigned to this issue. Some commenters indicated that it was unclear whether the data in tables 3-11 (Employment in selected industries in Nye County, 1978-2000) and 3-12 (Employment in selected industries in Clark County, 1978-2000) of the draft EA are supposed to estimate the number of persons employed by industry or the number of jobs provided by employers, since these are different concepts. The DOE was asked to clarify the EA definition of employment. The comment compared total 1978 Nye and Clark county employment, as shown in tables 3-11 and 3-12 of the draft EA, with ESD administrative data and concluded that there was a 46.7-percent discrepancy for Nye County and a 13.9-percent discrepancy for Clark County. It was felt, on the basis of this comparison, that the data in the two tables were questionable.

Response

Section 3.6.1 of the EA was revised to clarify that two sources of employment data are shown in the EA, and to discuss their differences and the reasons for using both. Briefly, where the text of the final EA presents totals or the percentage distribution in selected industries for 1980 and 1983, wage and salary employment data developed by the Nevada Employment Security Department (ESD) are used. These data are a count of the number of jobs. Since ESD does not produce long-term employment projections, data from the U.S. Bureau of Economic Analysis' OBERS projections were used to develop the projections appearing in tables 3-12 and 3-13 of the final EA. These data represent the number of persons employed. A new section was added to the final EA (Section 3.6.1.3) to discuss the methodology used to develop tables 3-12 and 3-13 of the final EA.

The total number of persons employed has been deleted from tables 3-12 and 3-13 of the final EA (tables 3-11 and 3-12 of the draft EA).

Issue: Industrial employment sector percentages

Three commenters identified minor discrepancies between reported Clark County employment percentages and industrial employment percentages according to the ESD administrative data. One of these commenters gave the following

percentage distribution of industrial employment for Clark County, taken from the State of Nevada Employment Security Department:

Mining	0.2%	F.I.R.E.	4.7%
Construction	6.4%	Service	47.2%
Manufacturing	3.1%	Hotel, Gaming, Recreation	31.7%
T.C.P.U.	6.0%	Government	11.7%
Trade	20.1%		

Response

Section 3.6.1.2 of the final EA was revised to show the percentage distribution using 1983 ESD values for wage and salary employment (State of Nevada, ESD, 1984). The new percentages are

Sector	Percentage of Total Jobs
Service	49
Trade	20
Government	12
Transportation and Public Utilities	6
Construction	5
Mining	0.1

Issue: Clark County employment growth rates

Two commenters stated that the Clark County 1978-1985 employment growth rates presented in Table 3-12 (Employment in selected industries in Clark County, 1978-2000) of the draft EA will be difficult to achieve. Furthermore, it was felt by both commenters that the draft EA projection of 370,221 persons employed in 1990 is significantly greater than the ESD forecast of 327,000 jobs.

Response

The primary purpose of Table 3-12 in the draft EA was to show employment projections for primary sectors. For this reason, the total shown in that table has been deleted from the final EA (Table 3-13). Some of the differences between ESD data and OBERS data used to develop tables 3-12 (of the draft EA) and 3-13 (of the final EA) are discussed in Section 3.6.1 of the final EA. Additionally, a discussion of the methodology used to develop Table 3-13 of the final EA appears in Section 3.6.1.3., a new section of the final EA.

Issue: Miscellaneous

Five comments were categorized into the miscellaneous issue. These are described in the following text.

In the second paragraph of Section 3.6.1 of the draft EA, Nevada real personal income is projected to grow at an average annual rate of 4.8 percent. The DOE was asked to present the method used to obtain this value.

One commenter noted that the written communication from L. Ryan, Director, State Office of Community Services, cited in Section 3.6.1.1 of the EA should be added to the reference section.

One commenter requested that the EA include a more detailed description of the method used to develop the baseline employment forecasts presented in Table 3-11 (Employment in selected industries in Nye County, 1978-2000) of the draft EA.

Two commenters considered baseline data concerning labor and materials markets to be inadequate. Increases in demand for these resources could cause price increases or supply delays, and it was noted that the EA does not discuss elasticity of supply in these markets. It was suggested that the DOE use examples from studies of "boom towns" to show whether "these local inflation conditions" would appear in the area surrounding the Yucca Mountain site.

Response

Section 3.6.1 of the draft EA was revised to discuss the method used to calculate the real personal income growth rate. As a result of using updated population information (DOC, 1985), this growth rate was revised to 4.6 percent in the final EA.

The EA was revised to include two letters from L. Ryan in the references for Chapter 3; they are cited as Ryan, 1984a and 1984b, when they both appear in the same chapter as references.

The final EA presents a more detailed description of the method used to develop the baseline employment projections for Nye County, in Section 3.6.1.3.

The possibility that increases in demand for labor and materials could cause price increases or supply delays will be the subject of more detailed investigations to be conducted if the Yucca Mountain site is approved for site characterization. Elasticity of supply could be one of the topics for research. Possible impacts on labor and materials markets could include changes in the level of activity in those markets, changes in quality of service, and changes in price levels associated with repository-related activities. However, "boom town" examples may not be relevant for the entire affected area and, given the planning and mitigation procedures provided in the Nuclear Waste Policy Act (NWPA, 1983), boom town conditions may not necessarily arise. (See Section C.4.1.5.4 of this Appendix.)

C.4.1.5.3 Community services

The U.S. Department of Energy (DOE) received 24 comments regarding the draft Environmental Assessment (EA) description of baseline community services in the affected area. The discussions within the draft EA addressing community services consisted of assessments of housing, education, water supply, sewage treatment, solid waste, energy utilities, public safety services, medical services, and library facilities. Before discussing particular issues raised by these comments, it is necessary to outline the rationale for the approach taken in preparing Section 3.6.3 of the draft EA.

Two of the main purposes of the EA are to make intersite comparisons and to identify potential impacts. To make the most effective use of its resources, the DOE conducted a coarse screening so that detailed studies would not be performed on sites which ultimately would not be chosen for site characterization. Two measures were used in the Yucca Mountain EA to evaluate potential impacts on community services: (1) total population growth rates with the repository and (2) existence of major potential impacts on delivery of community services, housing supply, and local government finances.

In evaluating the Yucca Mountain site against the Socioeconomic Impacts Guideline (10 CFR 960.5-2-6), favorable condition 1 was considered to be present as long as the annual county population growth rate in the affected area with the repository was forecast to be less than that experienced historically in the area. Potentially adverse condition 1 was evaluated by considering estimated community population growth rates with the repository and qualitative information on the ability of service providers to furnish the incremental levels of services and housing required by the repository-related inmigrants. The maximum one-year growth rate of the total population (i.e., baseline population plus estimated repository-related population) of each community in the affected area was used as an indicator of the potential for impacts on housing and community services, since these depend directly or indirectly on population. The qualitative information was obtained primarily from published sources and discussions with major service providers in the bicounty area.

By limiting the analysis of these favorable and potentially adverse conditions to these measures, the DOE was able to use readily available information and avoid the false impression of precision which would result from the combination of a more sophisticated analytical approach with insufficient data. Therefore, the information presented in Section 3.6.3 of the EA was limited to that which was readily available. The extensive primary research which would be necessary for a thorough evaluation of existing services and projection of future service needs, and which will be conducted in future site investigations, was therefore beyond the scope of the EA investigation. However, published information was used, whenever possible, to gain insights into the adequacy of existing services and to provide background information on individual communities. Finally, an analysis of the settlement patterns of recent Nevada Test Site (NTS) workers indicates that relatively few repository workers and dependents would be expected to

settle outside of Nye County, Indian Springs, and the Las Vegas urban area (see Table 5-26 of the final EA). Therefore, extensive background information on other rural Clark County communities was not necessary for this preliminary analysis.

Sections 3.6.3, 5.4.3, and 6.2.1.7.4 of the final EA have been revised to incorporate the foregoing discussion.

The comments and responses have been grouped into 10 issues: (1) State Services, (2) Housing Information, (3) Education, (4) Water Supplies, (5) Waste-Water Treatment and Disposal, (6) Public Safety, (7) Solid Waste, (8) Energy in Nye County, (9) Radioactive Emergency Response, and (10) Miscellaneous.

Issue: State services

Three commenters asked that the EA examine services provided by the State of Nevada which directly affect local governments and local communities.

Response

Section 3.6.3.8 of the final EA has been revised to include a brief description of social services provided by various levels of government, including the State of Nevada. Detailed information on other services provided by the State of Nevada were not necessary, as explained in the introduction to this section, for the type of analysis performed.

Issue: Housing information

Three comments were assigned to this issue. Two commenters pointed out that the Center for Business and Economics Research (CBER) at the University of Nevada, Las Vegas has more recent data on housing in Clark County. One requested that recent housing vacancy information and reasons why the Nye County housing vacancy rate was 17.9 percent in 1980 be presented. Another commenter described "housing" as a complex integration of many key sectors; and suggested it is affected not only by existing supply and demand but also by extraneous variables as diverse as the behavior of interest rates and the ability of local contractors to hire workers and obtain materials at reasonable costs. The commenter suggested that the financial and building industry underpinnings of "housing" in the affected area should be examined in great detail.

Response

The data mentioned by the commenters were requested from the CBER. However, the information provided did not update the housing characteristics data presented in the draft EA. Neither data on recent housing vacancy rates in Nye County nor reasons why the vacancy rate was 17.9 percent in 1980 were available from published sources during preparation of the draft EA. This type of information will be sought as part of research planned if the Yucca Mountain site is approved for site characterization.

Housing is indeed a "... complex integration of many key sectors of area activity." To assess the effects of repository development on housing at the county or community levels would require a depth of analysis which was outside the scope of the EA. Because a comprehensive housing analysis was not available, the types of detailed information identified in this comment were not presented in the community services background section of the EA. Additional research on housing in the affected area will be undertaken if the Yucca Mountain site is approved for site characterization.

Issue: Education

The DOE received three comments on the level of detail provided in the description of educational services. Commenters noted that schools per 1,000 residents is not a useful basis for comparison of capacity. It was suggested that considerably more detailed information on schools in each community (e.g., extent of overcrowding, busing requirements, student-teacher ratios, maintenance requirements, financing) should be provided in the EA.

Response

Numbers of schools, teachers, and other services per 1,000 population were presented in order to be able to perform a preliminary analysis of community service impacts in a consistent way for several types of services and for the two counties. The shortcomings of this approach are recognized; indeed a caveat on the comparison of the educational ratios for Nye and Clark counties is made in Section 3.6.3.2 of the final EA. While detailed information on classroom space, special education space, common areas, and other as yet unmet needs is certainly relevant to an analysis of the ability of local school districts to accommodate increased demand for educational services, it was felt that the information presented was suitable for the preliminary evaluation approach described above.

Issue: Water supplies

Two comments were received on this issue. One commenter stated that a much more in-depth evaluation of water capacity by source and location and use by demand segment in Nye County is required. Another commenter noted that the information provided in Chapter 3 of the draft EA does not indicate that a water-well inventory was attempted.

Response

The DOE agrees that a more thorough review of water supply and demand in southern Nye County is required in order to gain a complete understanding of potential impacts of repository-induced population growth in the area. Information available from published sources was, however, sufficient to reach the preliminary conclusion that water supplies would be sufficient, given solution of some existing problems. The analysis presented in Section 3.6.3.3 of the draft EA showed that if the present trend of conversion of land use in the Pahrump Valley from irrigated agriculture to residential development continues, then the valley-fill aquifer can support up to about 16,900 people without a decline in usable storage. The situation in the

Amargosa Valley, whose ground-water basin has been designated by the State Engineer, is less clear. Although the basin is over-appropriated, actual irrigation water use is less than half of the sustained yield (see Section 3.3.3 of the final EA). If agricultural development remains limited, then there would be considerable opportunity for expansion of domestic and quasi-municipal uses, which would have the highest preference; conversion of agricultural land use to residential as in Pahrump would improve the water supply situation further. Beatty's water supply problems are discussed in Section 3.6.3.3 of the EA. If new high-quality water sources are not found for that community, then its growth potential could be limited. Section 3.6.3.3 of the EA has been revised to incorporate new information about Amargosa Valley, including water-well information for those portions of the Amargosa Desert ground-water basin designated by the State Engineer.

Issue: Waste-water treatment and disposal

Four comments were assigned to this issue. Information on waste-water disposal regulations or planning guidelines for Nye County was requested. It was asked if existing sewage treatment facilities are at, or close to, capacity. An estimate was requested of the impact of projected future growth in the various areas on the adequacy of treatment systems. An explanation was requested of how local governments finance improvements and/or additions to sewage facilities.

Two commenters pointed out that the Boulder City, Clark County, and Las Vegas waste-water treatment plant capacity data presented in Table 3-21 of the draft EA are inaccurate, and that the "Peak Demand" column does not make any sense. Facilities in 12 additional communities in Clark, Nye, and Lincoln counties should be included in the table.

Response

Waste-water disposal regulations and/or planning guidelines provide indirect evidence of a county's ability to absorb future population growth. However, the method used to evaluate favorable condition 1 of the socioeconomic impacts guideline (see sections 3.6.3 and 6.2.1.7.3 of the final EA) precluded the necessity of examining local regulations in detail.

Peak load and capacity of major waste-water treatment facilities in Clark County are compared in Table 3-21 of the draft EA (Table 3-22 of the final EA). On the basis of new information (Walker, 1985) the EA was revised to state that the waste-water treatment capacity of the Beatty Water and Sanitation District has been reached. Information on the capacity and load on other systems in Nye County is unavailable from published sources. Section 3.6.3.4 of the draft EA has been revised to include more information on the capacity of waste-water treatment systems in Clark County. Information on local government measures for financing community services improvements was not necessary for the level of analysis conducted for the EA. This topic will be explored if the Yucca Mountain site is approved for site characterization.

The plant capacity figure for Boulder City in the draft EA was incorrect; it was obtained from a reference (Nevada Development Authority, 1984) which contained the erroneous value of 2.0 million gallons per day.

Table 3-21 of the draft EA (Table 3-22 of the final EA) has been revised to show a capacity of 1.3 million gallons per day. The capacity for the City of Las Vegas waste-water treatment plant is correct as shown, as verified in a letter from the City of Las Vegas (Donovan, 1984). A new reference for the capacity of the Clark County plant (which is correct as shown) has been added (Brown and Caldwell and Culp/Wesner/Culp, 1980).

Table 3-21 was also revised to show that Henderson uses a different type of waste-water treatment process than was reported in the draft EA. The heading "Peak Demand" was changed to "Peak Load."

Given the community services evaluation approach described in the introduction to this section, it was not necessary to include descriptions of the waste-water treatment system in each community in the affected area. As discussed in Section C.4.1.5 of this Appendix, Lincoln County was excluded from the analysis because the focus was on the areas in which most (i.e., 96 percent) the repository-related work force would likely settle.

Issue: Public safety

Three comments were assigned to this issue. Two commenters requested additional information on public safety services in Nye County, including station capacity, jail facilities, number of marked and unmarked cars, and communication and dispatch services. Another commenter pointed out that detention facilities are currently overcrowded and could be impacted by the influx of people. Increases in crime rates are a likely occurrence if population growth exceeds employment growth. Additional information on fire protection was requested, including numbers of fire departments, number and location of stations, personnel, fire ratings, condition of stations and equipment, number of incidents responded to, response time, and emergency medical services provided by fire departments. It was stated that the EA should contain standards of adequacy for rural and urban police and fire operations.

Response

Detailed information on police services in Nye County was unavailable from published sources during preparation of the draft EA. Furthermore, the level of detail requested in this comment is not necessary for the evaluation approach described in the introduction to this section.

The inadequacy of some of the detention facilities in Clark County was mentioned in Section 3.6.3.7 of the draft EA. Information on the extent of overcrowding of detention facilities in other parts of the affected area was unavailable from published sources during preparation of the draft EA. Similarly, available information was insufficient to support a judgment of whether "Increases in crime rates are a likely occurrence if population growth exceeds employment growth."

Detailed information on fire protection and emergency medical services was unavailable from published sources during preparation of the EA. Furthermore, details of the nature requested were not necessary for the evaluation approach described in the introduction to this section.

The main reason for not comparing community services levels with standards is presented under the "Miscellaneous" issue. There are several other reasons why use of national or regional police and fire protection standards was deemed inappropriate. In the Las Vegas urban area, the large visitor population makes problematical the use of standards derived from studies of cities without such a large tourism component. Also, an unknown number of private security officers are employed by the hotels and casinos in the Las Vegas area. Thus it is difficult to relate protective service levels to national data. In rural areas, especially in Nye County, per capita standards may also be inappropriate, given the large distances which must be covered by police and fire services.

Issue: Solid waste

One commenter requested additional information on the capacity and number of years remaining in expected landfill life, materials accepted at landfills, and methods of disposing of hazardous waste materials.

Response

Information on landfill capacity in Nye County was unavailable from published sources during preparation of the draft EA. This information would be obtained in future investigations if the Yucca Mountain site is approved for site characterization. Consideration of materials accepted at the landfills and the method of disposing of hazardous waste materials is not directly relevant in considering the impact of future population growth on community services.

Issue: Energy in Nye County

One commenter pointed out that the energy utility information provided in Section 3.6.3.6 of the draft EA does not give details on suppliers, capacity, and use in Nye County. This information, plus information on generation, transmission, distribution, and service facilities and capacity should be provided.

Response

Table 3-22 (Energy distributors in Nye and Clark counties) of the draft EA (Table 3-23 of the final EA) reports that the principal supplier of electrical energy to the communities of Nye County nearest the Yucca Mountain site is the Colorado River Commission. The utility which distributes the electricity is the Valley Electrical Association. Information on capacity and use in Nye County was not available from published sources. The remainder of the information requested by this commenter was not necessary for the evaluation approach described in the introduction to this section. However, the EA was revised to specify more clearly the service area of the Sierra Pacific Power Company and to show that Mount Wheeler Power supplies electricity to northwest Nye County.

Issue: Radioactive emergency response

Two commenters felt that the EA should provide more information on the capability of local police, fire, and medical care facilities to handle emergencies involving radioactive exposure.

Response

Published information on emergency services and special trauma and burn treatment facilities in Clark and Nye counties was unavailable during preparation of the draft EA. In addition no estimates of the number of emergency cases involving radiation exposure have been developed. It is therefore unreasonable at this point to assess the demands upon protective services and existing and proposed medical facilities by accidents of this nature. Further research into both the demand for emergency services and medical treatment of radiological accident cases and the proposed means for handling them will be conducted if the Yucca Mountain site is approved for site characterization.

Issue: Miscellaneous

Two commenters felt that the EA should not only express community service conditions quantitatively, but should also draw substantiated conclusions as to the adequacy of these conditions as they currently exist. The same observer reflected that no treatment of community services for Clark County can be considered adequate unless it specifically addresses the effects that massive numbers of tourists have on the type, level, adequacy, and overall status of each service category.

Response

In preparing the EA, comparison of levels of various services with national or regional standards was considered. It was decided, however, not to use these types of standards. Actual average historical service levels (in the form of per capita ratios) reveal citizen preferences; they implicitly take into account community judgment as to the adequacy of services. It is true that an analysis at the margin (i.e., of the additional services required by each additional member of the community) would be preferable. However, sufficient data for such an analysis were not available. More detailed investigations, to be undertaken if the Yucca Mountain site is approved for site characterization, will include consultation with communities to ascertain appropriate measures of service levels. Nevertheless, qualitative statements about the adequacy of water supply, public safety, medical, and recreation services are presented in final EA sections 3.6.3.3, 3.6.3.7, 3.6.3.8, and 3.6.3.10, respectively. Because the issue of the capability of State, county, and local service agencies to accommodate repository-related population growth is so important, detailed research in this area will also be conducted if the Yucca Mountain site is approved for site characterization.

The effects of large numbers of tourists on the ability of local agencies to provide community services are discussed briefly in sections 3.6.3.7 and 3.6.3.8 of the final EA. Further research in this area will be conducted if the Yucca Mountain site is approved for site characterization.

C.4.1.5.4 Social conditions

The U.S. Department of Energy (DOE) received 19 comments on sections of the Environmental Assessment (EA) devoted to background sociocultural characteristics in the affected area. From these, the following seven issues were identified: (1) Nye County Homogeneity, (2) Worker Settlement Patterns, (3) Urban Culture, (4) Social Organization and Structure, (5) Indian Tribes, (6) Boom-Bust Communities, and (7) Attitudes and Perceptions.

Issue: Nye County homogeneity

One commenter stated that the description of the population of Nye County as "fairly homogeneous" may be somewhat misleading and that in actuality (when the data are disaggregated) there are significant racial divisions. This commenter believed that a more useful approach would be to describe each community in terms of its unique ethnic, age, sex, racial, and even religious composition.

A second commenter questioned whether it was consistent to describe the population as "fairly homogeneous" if there were also relatively high numbers of Native Americans and if half of some areas are Hispanic.

Response

The statement regarding the homogeneity of Nye County population was based upon the aggregate data presented in Table 3-24 of the draft EA, Table 3-26 in the final EA (Comparison of selected social characteristics by region). The table shows that the Nye County population for 1980 was classified by the U.S. Department of Commerce, Bureau of the Census (DOC, 1983), as 100% rural and 92% white; both percentages were higher than the average for the United States, Mountain States, Western States, the State of Nevada, and Clark County.

The approach suggested by the first commenter would be useful. Data were, in fact, disaggregated, as much as possible, in the discussion of individual communities located close to the site (see section 3.6.4.1.1). However, only limited community-level information is available at this time. Additional community-level primary data will be sought if the Yucca Mountain site is approved for site characterization.

The description of Nye County as "fairly homogeneous" is not inconsistent when read in context. As noted above, the statement regarding the homogeneity of Nye County popultion was based upon aggregate data (presented in Table 3-26 of the final EA). These data also show relatively less variation in racial composition (with the exception of Native Americans, as noted) in Nye County than in other areas included in the table. The statement regarding the Hispanic population did not draw on the county-level data presented in the table and was attributed to only one small community within the county (the Town of Amargosa Valley; see section 3.6.4.1.1 of the draft and final EA).

Issue: Worker settlement patterns

Two comments were received relative to worker settlement patterns. It was stated that according to Section 3.6.4.1.1 of the draft EA, "... inmigrants would be most likely to settle in those rural communities that provide services and amenities." Other variables, such as distance from the work site and the fit between the inmigrating workers and the racial, ethnic, religious, and economic composition of the community were considered by these commenters to be of equal or greater influence.

Response

The DOE agrees that worker settlement patterns are a product of many factors in addition to levels of community services and amenities. The sentence in question has been deleted from the final EA.

Issue: Urban Culture

The five comments assigned to this issue address three topics: description of urban culture, alleged cultural bias of the investigators, and influence of tourism.

Description of urban culture. Although the DOE says in Section 3.6.4.2 of the draft EA that "... the rich diversity of cultures and lifestyles exhibited in Nye and Clark counties is outlined in the following section ...", the actual discussion of the issue consists only of broad generalizations, according to two commenters. In particular, the attempt to describe the "urban culture" of Clark County in one short paragraph in the draft EA was considered inadequate.

Response. The two subsections on rural and urban cultures (3.6.4.2.1 and 3.6.4.2.2, respectively) contain more than generalizations. Insufficient material was available from published sources to provide more detail and depth. However, the data presented in Section 3.6.4.2, along with those presented in Table 3-24 (Comparison of selected social characteristics by region) of the draft EA (Table 3-26 of the final EA), are adequate for the purpose for which they were intended. The purpose of Section 3.6.4.2.2 (Urban culture) was not to present a detailed portrait of urban culture, but rather to provide a basis for assessing the likely cultural compatibility of inmigrant workers and existing residents. As is emphasized in Section 5.4.4 of the EA, the assessment does not claim to be anything other than preliminary at this stage. At a minimum, there is an adequate basis for making the preliminary assertions that (1) considerable diversity of cultures exists in the affected area and (2) inmigrating workers are likely to be able to select a compatible cultural environment.

Alleged cultural bias of the investigators. One commenter objected to the cited conclusion by Adams, and Gottlieb and Wiley in the draft EA that "... all citizens must reach some accommodation between gaming and other cultural values." The commenters claim that this reflects the cultural bias of the investigators rather than the reality of the attitudes and beliefs of those citizens who live in a community where gaming is legal, socially acceptable, and almost excessively regulated.

Another commenter stated that those associated with gaming and tourism are not necessarily transients, but are generally part of the "more settled population groups." They stated that Section 3.6.4.2.2 of the draft EA was obviously written by someone not familiar with the area.

Response. In the absence of primary data gathering and analysis (which would permit exploration of deeply felt attitudes and beliefs), the DOE was limited to documentation of the overt part of the culture and to published statements concerning cultural values. Documentation was deliberately selected from regional and local sources in order to avoid the possibility of cultural bias. Section 3.6.4.2.2 of the EA has been revised to delete the reference to Gottlieb and Wiley. References in that section have been limited to Nevada sources.

The statement to which the second comment refers is, "A basic division, however, may be discerned between the life styles of the transients (associated with gaming and tourism) and relatively more settled population groups." The reviewers evidently interpreted "transients" to mean local employees in the gaming and tourism sectors. This was not the intention of this statement. Not all of those associated with gaming and tourism are necessarily transients. However, the 12.5 million visitors who stayed an average of 4.3 nights in 1984 (Las Vegas Review-Journal et al., 1985) could certainly be classified as transients (i.e., persons who are passing through or by a place with a brief stay or sojourn). The EA has been revised to exclude the word "transients".

Influence of tourism. Statements in Section 3.6.4.2 of the draft EA suggested to one reviewer that there is a basic division between people who work in gaming and people in other occupations. This commenter noted that a more significant impact resulting from gaming is the large influx of tourists and that the EA should focus on the influences of tourism, including its importance to the social, cultural, and economic fabric of the community.

Response. The DOE did not intend to suggest that there is a basic division between people who work in gaming and other Clark County residents. It is true that many people who work in gaming-related capacities also hold other jobs. The basic division is between persons who are settled members of the community and those who are "passing through." The "two faces" of Las Vegas which are noted in Section 3.6.4.2.2 of the draft and final EA are part of its uniqueness. The influences of tourism and gaming are closely interwoven. Section 3.6.4.2.2 of the EA has been revised to clarify the two major aspects of the Clark County culture: The image of Las Vegas as the "Entertainment Capital of the World," and the cultural diversity that exists.

Issue: Social organization and structure

The five comments assigned to this issue address four topics: social organization and dynamics, imbalance in the description of Las Vegas, comparison between Nye County and Clark County, and influence of tourism.

Social organization and dynamics. It was stated that sections 3.6.4.1.1 and 3.6.4.1.2 of the draft EA contain no description of the dynamic interplay of relationships that characterize each community and make it unique. According to two commenters the EA should examine the social organization and structure of each jurisdiction, with special attention given to those communities, or even neighborhoods, where prospective repository workers are most likely to settle.

Response. The types of information and analyses requested by these commenters are more appropriate to an Environmental Impact Statement than to an Environmental Assessment. In the absence of community-level primary data gathering and analysis, it is not possible to provide the type of portrait requested. Additional primary data gathering and analysis to be undertaken as part of the Environmental Impact Statement (EIS) process, if the Yucca Mountain site is approved for site characterization, should permit a more detailed treatment of social organization.

Imbalance in the description of Las Vegas. One commenter expressed the opinion that the statements made about Clark County in Section 3.6.4.1.2 of the draft EA should be balanced by a discussion regarding the "normal community" aspect of Las Vegas.

Response. The discussion requested by the commenter is in Section 3.6.4.2.2 of the draft EA.

Comparison between Nye County and Clark County. One commenter stated that comparisons between Nye and Clark counties are worthless. This same commenter felt that the draft EA discussion of rural social organization and structure (first paragraph, Section 3.6.4.1.1) is self-serving, and that operating from a small population base it is easy to show rapid growth and low social problems.

Response. The paragraph in question was not intended to be self-serving; it is more appropriately viewed as one part of an entire section which points out differences between the urban and rural sections of the affected area. This section of the final EA has been revised to include a caveat regarding the small numbers and the small population base in Nye County.

Influence of tourism. The comment was made that statistics presented in Section 3.6.4.1.2 of the draft EA should reflect the influence of tourists.

Response. Section 3.6.4.1.2 has been revised to include the statement that certain social indicators such as rates of divorce, homicide, and crime are inflated by the large number of nonresidents. Suicide rates for Clark and Nye counties were calculated from data on suicide by county of residence, and therefore are not inflated.

Issue: Indian Tribes

One commenter felt that little information on Indian Tribes was provided in the draft EA. A second commenter, noting that the Shoshone people continue to claim the land on which the repository is proposed to be built,

emphasized that an understanding of their culture and its reverence for the land would be essential if conflict between repository interests and Indian interests and culture is to be avoided.

Response

As was discussed in Section C.4.1.5 of this Appendix, Native Americans in southern Nevada have not been singled out for special analysis in the EA because they have not been certified as "affected" tribes within the meaning of Section 2(2)(B) of the Nuclear Waste Policy Act of 1982 (NWPA, 1983). A petition of certification under Section 2(2)(B) was specifically denied the Moapa Band of Paiutes (Frit, 1984). Therefore, Native Americans have been addressed in the EA in a manner similar to other cultural units in the affected area.

Furthermore, American Indian reservations, being relatively distant from the Yucca Mountain site, are not expected to be affected significantly by the inmigration of repository-related workers and their dependents. The final EA has been revised to include more detail regarding the number of American Indians residing in the bicounty area and their location relative to the Yucca Mountain site. Specific note was made (in Section 5.4.4.2 of the draft EA) of the potential for impacts on Native American cultures from transportation activities. This discussion has been expanded further in the final EA. When actual transportation routes are identified, additional research on this subject will be undertaken. In addition, the potential impacts of the repository project on Native Americans who live both on and off reservations (as well as other cultural groups in southern Nevada) would be included in the more detailed, community-level data gathering and analysis to be conducted if the Yucca Mountain site is approved for site characterization.

In preparing the draft EA, the DOE was aware of the Shoshone claims to the land upon which the repository is proposed to be built. However, the land claim issue was not addressed in the EA because of the Federal Government position that the Shoshone had no legal right to the land. This position was sustained by a recent U.S. Supreme Court decision which effectively extinguished the Western Shoshone claim of aboriginal title to much of Nevada, including the Yucca Mountain Site (United States v. Dann and Dann, 1985). Awareness of Native American (including Shoshone) reverence for the land is indicated in the wording and references of Section 5.4.4.2 of the final EA. As noted in the preceding paragraph, the potential for impacts on Native American culture, as on other cultures in the affected area, will be assessed during the detailed community-level data gathering and analysis to be conducted if the Yucca Mountain site is approved for site characterization.

Issue: Boom-bust communities

The comment assigned to this issue addresses two topics: boom-bust cycles, and community-specific examination of rural culture.

Boom-bust cycles. One commenter suggested that since the effects of boom-bust economic cycles have had such major impacts on rural communities in

Nevada, a fairly comprehensive discussion of the extensive literature on boom-bust communities in the West might be very appropriate in section 3.6.4.2.1 of the EA.

Response. A comprehensive review of the boom-bust literature was not considered appropriate for the EA because (1) the boom-bust literature, which has been undergoing revision (see Murdock et al., 1985; and Wilkinson et al., 1982), is not relevant for the entire affected area and (2) a focus on boom-bust literature presupposes that the repository would also cause boom-bust conditions, which is by no means certain given the planning and mitigation procedures provided in the Nuclear Waste Policy Act (NWPA, 1983). Nevertheless, several references were identified in the draft EA so that the reader could pursue additional material if desired. An additional reference (Murdock et al., 1985) has been included in the final EA. Together, the references cited in Section 3.6.4.1 of the final EA provide a comprehensive overview of the early boom-bust literature and more recent thinking in the field.

Community-specific examination of rural culture. One commenter felt that to be useful, an examination of the characteristics of rural culture should be community-specific, so that the key elements of unique cultural manifestations in each community and the potential for repository impacts can be examined.

Response. While it is true that it would be more meaningful to address community-specific cultural characteristics, insufficient information was available from published sources during EA preparation to provide the community specificity, detail, and depth called for by this comment. This kind of detailed data will be sought during studies undertaken if the Yucca Mountain site is approved for site characterization.

Issue: Attitudes and perceptions

The two topics in this issue concern the incomplete survey data in Section 3.6.4.4 of the draft EA and the need to study attitudes towards the repository on a statewide basis.

Incomplete survey data. One commenter stated that according to the survey cited in Section 3.6.4.4 of the draft EA, a majority of those surveyed opposed the idea of locating a repository "... on the Test Site in southern Nevada ..." and 6 percent were undecided. Since the 6-percent figure is known for those undecided, it was asked why the figure for those opposed was not expressed in terms of a percentage. The commenter also asked whether respondent answers would have been even less favorable if they had known that only part of the proposed repository site is actually on the Nevada Test site (NTS).

Response. The final EA has been revised to summarize all the percentages as follows:

Strongly favor	6.4%
Favor	23.9%
Oppose	26.7%
Strongly oppose	37.4%
Undecided/don't know	5.6%

The complete survey responses are included with all the other EA references on file for public viewing (UNLV, 1984). It is not appropriate for the DOE to speculate on the respondents' answers under alternative hypothetical situations.

Attitude surveys. A final commenter felt that attitudes toward the repository should be gathered on a statewide and interstate basis, since to identify one or two counties as the only recipients of major impacts is misleading at best.

Response. As noted in Section C.4.1.5 of this Appendix, none of the siting guidelines which address socioeconomic issues requires evaluation of impacts at the level of a State. For the qualifying condition, favorable conditions, and potentially adverse conditions under the Guideline on Socioeconomic Impacts (10 CFR 960.5-2-6), the DOE is to address potential impacts on and in "the affected area," which is defined as Clark and Nye counties. Historical settlement patterns of workers at the NTS, adjacent to the proposed repository site, indicate that most (96 percent) of the repository related population could be expected to settle in these two counties. It is expected that studies undertaken in preparation for the EIS would encompass a larger geographic area, as appropriate, based on the EIS scoping process, if the Yucca Mountain site is approved for site characterization.

C.4.1.5.5 Government and fiscal conditions

The U.S. Department of Energy (DOE) received four comments on the draft Environmental Assessment (EA) presentation of background information on government and fiscal conditions in the affected area. These have been grouped into two issues: (1) Additional Data and (2) Effects of 1983 Legislation.

Issue: Additional data

Three commenters thought that although the draft EA does contain some data on government services and revenues by source, baseline data needed to conduct an analysis of fiscal impacts to State and local governments as a result of the repository were insufficient, even as a starting point.

Response

It is true that a broad base of information is required on the fiscal conditions of potentially affected jurisdictions in order to assess financial impacts. This information would be acquired during studies conducted

concurrently with site characterization and form the basis of analyses appearing in the Environmental Impact Statement, if the Yucca Mountain site is approved for site characteriztion. The information presented in Section 3.6.5 of the draft EA is a starting point; it identifies the government entities most likely to be affected by a Yucca Mountain repository and the sources of revenues that are important to those entities.

Issue: Effects of 1983 legislation

One commenter asked that the EA provide some mention of the impact that the 1983 legislative changes have had on local governments, saying that revenues are far less prevalent than before 1983.

Response

The 1983 State Legislature made some adjustments in the State property tax laws. However, it is not believed that these changes would affect the results of the socioeconomic impact analysis. Detailed analyses of government fiscal structures will be undertaken during site investigatons to be conducted if the Yucca Mountain site is approved for site characterization.

C.4.2 ACTIVITIES PROPOSED FOR SITE CHARACTERIZATION

This category addresses comments and questions received on the site-characterization activities proposed for Yucca Mountain. It does not include, however, questions on the environmental and socioeconomic impacts from these activities (see sections C.7.2 and C.7.4 of this document). Specific questions regarding site characterization field studies and the exploratory shaft are answered in the following subsections. Seven general comments were received on this subject and they are answered below. One commenter asked how the equipment used during site characterization will be moved to and from the site and how it will be stored, and another asked that the Environmental Assessment (EA) include a discussion of California State regulations regarding equipment use and construction activities. Another commenter suggested that site characterization should be conducted with great care because the preferred depth of emplacement 300 meters (984 feet) may not accommodate all the waste. A fourth commenter stated that the standard operating practices identified in the EA should include provisions for storing and managing hazardous materials such as waste oil and solvents from the maintenance of heavy equipment. The last two commenters addressed site characterization studies in general (including geochemical surveys), saying that these tests should be completed prior to completion of the Environmental Impact Statement in order that their results may be evaluated by the appropriate reviewing agencies.

Response

Equipment will be moved to and from the site by conventional methods (e.g., by the motor power of each piece of equipment or on flat-bed trucks). The equipment will be stored, used, and removed in a conventional manner. The amount of equipment is insignificant compared to that which will be used

during repository construction and operations. Federal regulations are included in the specifications that dictate the design of all systems in the exploratory shaft facility. California Mine Safety Orders are referenced because they have been historically used on the Nevada Test Site (NTS) and are judged to be sufficient to meet all applicable Federal regulations. The California Mine Safety Orders are also specified in U.S Department of Energy Order 5480.1A (DOE, 1981) and 5480.4 (DOE, 1984). In addition, the Nevada mining regulations incorporate the Federal regulations by reference.

The favorable condition regarding adequate host-rock flexibility was not claimed for the site, since only site characterization activities can result in a clear definition of the three-dimensional variability in rock properties. The data will allow the DOE to position the repository to enhance waste containment and isolation.

The standard operating practices used on the NTS for storing and managing materials such as waste oil and solvents will be used by the contractor during the construction of the exploratory shaft facility. These substances will not be disposed of on the ground at Yucca Mountain.

While geochemical surveys and field activities have been included under the category of "Exploratory Drilling" (Section 4.1.1.1 of the final EA), the overall site characterization activities described in Section 4.1.3 of the final EA will result in considerable data that will be used to prepare the Environmental Impact Statement. It will not be possible to complete all activities scheduled for site characterization before the Environmental Impact Statement is released. Therefore, monitoring will continue beyond release of the Environmental Impact Statement and interim data and technical reports will be published so the appropriate reviewing agencies can have access to the results.

C.4.2.1 Field studies

This category contains all questions and comments on the adequacy and accuracy of the field studies proposed for site characterization. Seven comments were received on this subject. One commenter asked for the locations of boreholes that would be drilled at the site to map the water table. Other commenters stated that although geologic and nongeologic data will be collected during site characterization, only the plans for collecting geologic data are presented in the draft Environmental Assessment (EA), and a fourth specifically requested that ground motion studies be not only continued, but also expanded. It was also requested that a detailed site characterization plan be released after the final EA is published, and reviewed by the Nuclear Regulatory Commission (NRC) to assure that key licensing issues will be addressed. In a related comment, a sixth commenter suggested that further drilling studies be conducted to assure that no pressurized brine pockets, water, or toxic gases are present in the repository horizon. Lastly, it was suggested that an independent contractor, responsible to the State of Nevada,

monitor all site characterization activities in order to cross-check and validate the U.S. Department of Energy and U.S. Geological Survey studies and results.

Response

About twenty new exploratory holes will be drilled during site characterization. The exact locations of each drill site will be included in the Site Characterization Plan (SCP) which will be issued after the final EA has been published if Yucca Mountain is recommended for site characterization. Further ground motion studies are also planned.

The nongeologic data to be gathered during site characterization will be described in two separate documents. These documents will address environmental and socioeconomic subjects. The EA is not an appropriate document for a thorough description of data-gathering activities planned during site characterization.

After the EA is published, a very detailed plan for site characterization will be released if the Yucca Mountain site is recommended. The NRC along with the State and other members of the public will review this plan to assure that key licensing issues have been identified in the SCP, and to assure that the plans for testing provided in the SCP will result in information that will help resolve licensing issues. However, State of Nevada monitoring of site characterization activities must occur at the discretion of State authorities.

C.4.2.2 Exploratory shaft

This category includes 27 comments on the construction, operation, and decommissioning of the exploratory shaft, related surface facilities, and the tests that are planned from the exploratory shaft. Because of the variety of subjects that are covered by this category, it has been divided into four issues: (1) Exploratory Shaft Facility, (2) Potential Contamination, (3) Tracer Studies, and (4) Miscellaneous.

Issue: Exploratory shaft facility

Six comments were received on this issue. A better explanation was requested of why the faults shown on lithologic logs were not shown on cross sections in the draft Environmental Assessment (EA). Also requested were the dimensions of the underground facility. Another commenter suggested using long drifts and small-diameter holes during site characterization. Other recommendations were that design of the exploratory shaft should take into consideration the Probable Maximum Flood rather than a 100-year flood. Finally, one commenter wanted to know how much time would be required to construct the facility.

Response

The scale of the cross sections in the EA, such as Figure 5-5 (East-west cross section of the proposed Yucca Mountain repository) of the draft EA, are

too small to illustrate faults observed in cores, since the ratios needed to illustrate these would be on the order of 1:1,250. Furthermore, these faults may not intersect the surface, and thus would not be included on maps that show surface locations of faults.

The exact dimensions of the underground openings are not known at this time because the Exploratory Shaft Test Plan has not been completed. The relative magnitude of the openings, however, can be estimated from Figure 4-1 (Three-dimensional illustration of the exploratory shaft facility) in the final EA.

The technical feasibility of using long-hole drilling techniques with air as the drilling fluid is of concern to the Nevada Nuclear Waste Storage Investigations (NNWSI) Project. Expansion of the drifts to obtain necessary site characterization data is being considered.

The U.S. Department of Energy (DOE) agrees that it will consider the Probable Maximum Flood rather than only the 100-year flood. This has been indicated in the final EA.

In Section 4.1.2.1 of the draft EA it states that the surface facility should take 6 to 7 months to complete, and the underground facility an estimated 23 months to complete.

Issue: Potential contamination

Nine comments were received on this issue. Two commenters requested information about the quantity and content of liquid effluents that might percolate into the alluvium from the sewage lagoon and the rock-storage area and potentially interfere with planned hydrologic tests. The commenters also suggested that liners be used to reduce this potential infiltration and recommended that all sewage be disposed of to the east or west of the site. Environmental impacts of the proposed design were requested. It was also asked whether the design included a 100-year storm specification. Another commenter stated that the requirements of the Nuclear Waste Policy Act in regard to the use of radioactive materials should be described in the EA. Finally, one commenter suggested that the draft EA was inconsistent by stating that radioactive materials would not be used for testing during site characterization and then stating that radioactive tracer materials would be used.

Response

Even though the quantity of effluents in the seepage fields probably would not interfere with testing in the exploratory shaft, a decision has been made to extend the sewer line off the repository block. The sewer-lagoon concept has been abandoned in favor of a septic tank and drain field. Discharge from the septic system will be sufficiently above the water table that there will be no impact to ground water. The design of the exploratory shaft facility will be modified to remove the sewage to drain fields to the east of the proposed repository block. Mine refuse water will be removed from the site, and disposed of in the lined rock-storage pile. Finally, the details of the storm-runoff drainage design around the exploratory shaft facility site are being modified. However, it was not intended that the